THE MENTAL SURVEY

RUDOLF PINTNER

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THE MENTAL SURVEY

BY

RUDOLF PINTNER

PROFESSOR OF PSYCHOLOGY, OHIO STATE UNIVERSITY

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PREFACE

I HAVE attempted to develop a method of tests for group purposes, in order to measure roughly the intelligence of large groups of children. The work began owing to the practical problem of finding the number of feeble-minded in a school or institution. To avoid needless testing of perfectly normal children some rough preliminary tests were made. The tests I turned to were those which had been fairly well standardized at the time, and that is the explanation of the tests I am presenting here. No claim is made that they are the best tests for such purposes. Doubtless better groups of tests will be devised in the future.

The application of the mental survey to schools and the evaluation of school achievement in terms of mentality, is, I believe, the most important aspect of the present study.

The book is divided into two parts. The first describes the method of standardization and gives some results. The second part is a guide for the use of the tests and has been written as clearly and simply as possible, so that the worker may follow, step by step, the procedure in giving, scoring and evaluating the tests.

The material required for the survey tests is the standard material supplied by the C. H. Stoelting Company of Chicago. I have given illustrations of the test blanks used, with measurements of the size of the test sheets, so that those who may wish to print their own test blanks may do so.

In the collection of the data for this book I am indebted to many people for their help and coöperation. I wish to

thank the principals and teachers of the schools in which the surveys were made, for their courtesy and their willingness to make out the lists of pupils according to their estimates of intelligence. I wish also to thank my advanced students for their assistance in conducting the surveys. I wish further to thank Mr. C. O. Edington for the data obtained from the rural schools, and Mr. D. G. Paterson for allowing me to add to my norms the results obtained by him from about three hundred children. To Miss Lucille Boylan I am indebted for the tests given at Vineland, and I wish here to thank her and the Psychological Department at the Training School for their coöperation.

RUDOLF PINTNER.

Columbus, Ohio

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THE MENTAL SURVEY

CHAPTER I

INTRODUCTION

THE measurement of the mentality of individuals is now so customary and so well established, that the time seems ripe to extend the field of mental measurement to groups. The mental examination of an individual takes at least thirty minutes and often an hour or longer. This makes the measurement of large numbers an exceedingly slow and laborious procedure. By the individual method a survey of all the children in an institution or in a school system is practically impossible. For this reason it would seem desirable to have survey tests whereby large numbers may be tested at the same time. In doing this we must bear in mind that we are sacrificing an accurate diagnosis of the individual for an approximate estimate of the mentality of the group.

Granted that this is feasible, it will be obvious at once that the mental survey may be put to good use in many ways. There are at least three different fields in which survey tests would seem to be of distinct value, namely, (1) surveys for estimating

feeblemindedness; (2) educational surveys; (3) social surveys.

1. **Surveys for Estimating Feeblemindedness.**— Here the survey tests will be used for purposes of preliminary classification of the inmates of an institution. After such preliminary classification more intensive investigation of any particular group in the institution may be undertaken by individual tests. Since the problem is to select the feebleminded cases, the investigator will begin with those who made the poorest score on the survey tests and work upwards.[1] Whether it is possible to diagnose feeblemindedness by means of survey tests alone will be discussed later.

A need for survey tests of this nature has been felt by investigators in state surveys of feeblemindedness. In such surveys the inmates of all the charitable and correctional institutions can rarely be tested individually, and, therefore, the investigator is forced to give a rough guess at the number of feebleminded or be content with individual tests of a few inmates from which he may draw conclusions as to the mentality of the remainder. If standardized survey tests are available, the individuals re-

[1] Pintner, R., "The Mentality of the Dependent Child, Together with a Plan for a Mental Survey of an Institution." *Jour. of. Ed. Psych.*, Vol. VIII, 3 (1917), 220-238.

quiring special examination can be selected at once, and with much greater accuracy.

2. **Educational Surveys.**—A second use of these survey tests consists in the classification of schools according to their mentality. Up to the present time this has never been attempted, but there can be no doubt of the desirability of such classification. That children in different schools differ in their mentality is very obvious, and it would be very desirable to measure this difference, so that the educational work performed by a school could be evaluated in terms of the mentality of the children attending the school. If children in school A possess better mentality than children in school B, then school A ought to be doing better educational work than school B. An attempt to demonstrate how this can be done is shown in Chapter VI.

This use of mental tests is bound to be of the greatest significance in the future. Mental tests and educational measurements have been developing side by side and the method here advocated will prove to be the necessary link to connect the two and make the work of both of much greater significance. We must evaluate the results of our educational tests in terms of mentality.

3. **Social Surveys.**—A third use of survey tests is their use in connection with social surveys. A measure of the mentality of the community, how-

ever rough this may be, cannot but be a distinct asset to a social survey. For the present it would appear that we must estimate the mentality of a community from the mentality of its school population. That the mentality of the children in school will correspond closely to the mentality of the community as a whole is a justifiable inference. Having obtained in this way a rough measure of the mentality of a community, it is bound to be of decided help in interpreting the conditions brought to light by the social survey. So far as the writer knows this has not yet been attempted.[2]

These three uses to which survey tests may be put, namely, in the institution, the school and the community, indicate a very wide field for this type of test if it proves to be at all feasible. The very nature of the work prescribes the type of test and the method of application. The individual scale with its long series of tests is at once seen to be impracticable. Survey tests must be such as can be given to large groups at the same time and this necessarily involves writing on the part of the subject in

[2] An example of how this may be done has been indicated by the writer in a rough test of a small village community. Pintner, R., "A Mental Survey of the School Population of a Village," *School and Society,* Vol. V (May 19, 1917), 597-600. See also, Paterson, D. G., "A Mental Survey of the School Population of a Kansas Town," *School and Society,* Vol. VII (Jan. 19, 1918), 84-89.

some form or other. The number of tests that may be given is limited by the length of time during which the attention and interest of a group can be held. It would not seem desirable to allow the examination to extend over a longer period than two hours and preferably not so long. Generally this is longer than the ordinary individual examination, but in giving group tests a certain period of the time is consumed by the distribution and collection of test blanks and by the instructions of the examiner. This serves to break up the period and allows a certain amount of relaxation.

In all the work that follows it must be constantly borne in mind that the results of a few survey tests can never give as accurate an estimate of the mentality of an individual as the results obtained from a standard scale for individual measurement, such as the Binet or the Yerkes Scales.

There are a great many sources of error that enter into the examination of a group of individuals, so that we are never justified in considering the result of a series of survey tests as being an accurate measure of an individual's mentality. The examiner can never be certain of the undivided attention of all the individuals in the group, as he can make certain of the undivided attention of the single examinee. Physical discomfort, illness, laziness, bad temper, or fear may exist in a member of the group

and remain undetected, and in so far as such distractions from efficient mental work exist, survey tests fail to measure accurately mental ability. Again chances of copying from other individuals in the group, or working after the signal to stop has been given cannot always be detected. So we may have some individuals doing poorer than their mentality warrants and other individuals doing better than their mentality warrants. With large numbers these two sources of error may to some extent counterbalance each other. It would seem to the writer from actual observation that on the whole these distractions do not often occur and, if they do, they affect such a small number of the group as not materially to affect the measurement of the mentality of the group as a whole. Survey tests are not intended for accurate individual estimates of intelligence, but rather for rough measurements of the mentality of groups.

The discussion of the survey tests which follows is divided into two parts.

Part I describes the tests, omitting, however, all reference to procedure and scoring. It further gives an account of the standardization of the tests and the results of some schools and groups of individuals tested. It further attempts to show the method of evaluating the educational achievement

of schools in terms of the mentality of the schools as determined by the survey tests.

Part II is a guide for the use of the tests. Here we have attempted to describe the procedure in the order required by the worker making the survey, namely, method of giving the tests, scoring, evaluating the results. In this part will be found all the tables of norms that the worker will require.

PART I

THE TESTS AND THEIR STANDARDIZATION

CHAPTER II

THE TESTS

This chapter contains a description of the tests used together with a brief account of the work of others with the same tests.

Test I Rote Memory Test

This test is one of immediate memory for serial impressions. The presentation is auditory and the response is made in writing. The words used and the procedure followed are given in Part II of this book. The words chosen are those used by Pyle.[3] Only the first list of concrete words has been used. The same method of scoring has been adopted and this allows a comparison of Pyle's average score at each age with the median score at each age obtained by the writer. It will be noted that Pyle keeps the results for the two sexes apart, giving averages at each age for boys and for girls. In the present work this has not been done because sex differences in these tests are too slight to justify

[3] Pyle, W. H., "The Examination of School Children" (Macmillan, 1913).

separate norms for boys and girls. It seemed, therefore, better to mass all the results together.

Age	8	9	10	11	12	13	14	15	16	17	18	Ad.	No. of Cases
Boys, Av.	31	32	36	38	38	38	40	40	43	46	49	44	
Pyle													990
Girls, Av.	33	33	40	38	39	40	44	42	43	41	52	48	
Pintner, Med.	25	31	34	38	41	43	44	43	45	..	..	56	3,392

Pyle's norms for the younger ages are much higher than ours, suggesting a rather more select group of eight-, nine-, and ten-year-olds. The eight-year-olds are probably the brighter, more accelerated children in the higher classes. Our medians show a more uniform tendency to increase from age to age. No other work with exactly the same list of words as used by Pyle is known to the writer, although tests of rote memory with very similar lists are numerous, and for these the reader must be referred to Whipple.[4]

Test II Digit-Symbol Test

This is one of the group of tests called "substitution tests." Like all of this class of tests it is essentially a learning test. It measures the rapidity with which new associations can be built up. The subject copies symbols which correspond to the nine digits, the symbols and digits being before him

[4] Whipple, G. M., "Manual of Mental and Physical Tests," Part II; p. 150 *et seq.*

all the time, that is, he substitutes one thing for another. Because the key is always in front of him, he is not compelled to memorize the symbols before starting to work nor to rely upon his memory during the work. He is, in fact, told to start copying at once and is not allowed to waste time trying to memorize. The quicker he is able to form the associations between the symbols and digits, the less often will he be required to glance up at the key and therefore the quicker he will be able to work. The test is evidently testing something that is fundamental in all learning, i. e., the ability to form new associations. A picture of the test is shown in Figure 1. This picture is a reproduction of the blank used. The actual measurements of the blank, excluding the white margin, are 5½ x 9⅜ inches.

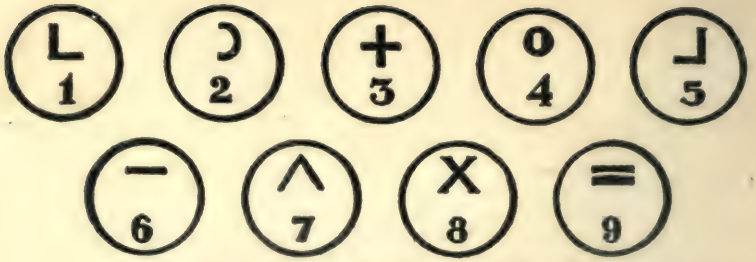
Work with this test has been reported by Whipple and by Pyle.[5] Pintner and Paterson have used this test extensively with deaf [6] subjects. Our best comparison is again with the norms obtained by Pyle.

Here again our norms increase more uniformly

[5] Whipple, G. M., *op. cit.*, Vol. II, 133 *et seq.*

Pyle, W. H., "The Examination of School Children"; and "The Mind of the Negro Child," *School and Society*, Vol. I (1915), 357.

[6] Pintner, R., and Paterson, D. G., "Learning Tests with Deaf Children," *Psych. Review Monographs*, Vol. XX, whole No. 88 (Feb., 1916).



84,976						27,516					
79,821						33,821					
63,442						97,473					
21,629						62,978					
57,183						31,542					
32,761						17,143					
95,146						26,981					
28,349						35,724					
73,862						16,315					
91,563						14,923					
37,628						34,762					
42,916						28,543					
23,729						83,936					
85,652						75,314					
35,486						56,283					
29,635						19,175					
72,518						36,293					
24,631						85,746					
19,852						15,283					
76,431						24,976					

FIGURE 1. THE DIGIT-SYMBOL TEST.

Age	8	9	10	11	12	13	14	15	16	17	18	Ad.	No. of Cases
Boys, Av.	10	13	15	16	19	23	21	25	25	24	29	29	
Pyle													1,124
Girls, Av.	13	16	19	19	23	23	27	27	28	29	26	32	
Pintner, Med.	7	11	14	16	18	21	24	25	25	..	..	30	3,609

from age to age than do the norms of Pyle. Our norms at every age are lower than Pyle's, decidedly so at ages eight and nine. Again there is the suggestion of a more select group of younger children in Pyle's standardization.

Test III Symbol-Digit Test

This test is of the same type as the Digit-Symbol Test, only in this case the subject inserts the digits instead of the symbols as in the previous case. A picture of the test is shown in Figure 2. This picture is a direct reproduction of the blank used by us. The actual measurements are 7¾ x 9⅜ inches. It will be noted on the picture that the asterisk is not clearly printed the first few times that it appears. This is also true of the printing on the actual blanks used, due to a slight defect of the cut from which the blanks were printed. No explanations were given to the children about this defective printing and they were left to their own devices in regard to it. If the child omitted to insert the digit "2" in the first space and by so doing misplaced the next four digits only one error was counted. This

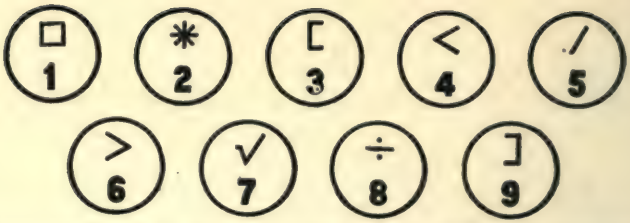


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FIGURE 2. THE SYMBOL-DIGIT TEST.

will become clearer from a discussion of the method of scoring in Part II of this book.

Results with this test have been reported by Pyle [7] for school children, and by Pintner and Paterson [8] for deaf children. Our best comparison is again with the results of Pyle:—

Age	8	9	10	11	12	13	14	15	16	17	18	Ad.	No. of Cases
Boys, Av.	10	13	17	18	19	21	23	26	28	26	28	33	
Pyle													1,380
Girls, Av.	11	16	20	20	23	26	27	30	29	32	33	31	
Pintner, Med.	6	11	14	16	18	21	23	24	23	..	..	31	3,622

The comparison shows the same tendency as in the Digit-Symbol Test, namely the tendency for our norms to be slightly lower, particularly in the lower ages, and for our norms to increase more uniformly from age to age than Pyle's norms.

Test IV Word Building Test

This test is grouped by Whipple under tests of imagination and invention. In regard to it, he says, "It is one that calls for ingenuity and active attention; it might fairly be said to demand that ability to combine isolated fragments into a whole, which Ebbinghaus has declared to be the essence of intelligence, . . . and finally, its execution is conditioned to a certain extent by the richness and readiness of the examinee's word vocabulary."

[7] Pyle, W. H., *op. cit.*

[8] Pintner, R., and Paterson, D. G., *op. cit.*

Of the two standard series of letters in common use, namely a e o b m t and a e i r l p, we have used the aeirlp-test only. Our blank has the letters A E I R L P printed at the top, as shown in Figure 3. Nothing else was printed on the sheet. The measurements of the blank are 8½ x 11 inches.

Considerable work with this test has already been reported, in particular by Whipple,[9] Pyle [10] and Anderson.[11] A comparison of our medians with the averages computed by Whipple from the data of Anderson and Pyle is as follows:—

Age		8	9	10	11	12	13	14	15	16	17	18	Ad.	No. of Cases
Anderson, and Pyle,	Boys, Av....	6	7	8	10	11	13	14	16	17	19	16	22	2,088
	Girls, Av...	7	8	10	12	13	15	16	17	18	18	19	21	
Pintner, Med.....		3	4	5	6	8	9	10	11	11	..	..	18	3,462

The comparison of the norms in this case shows that our medians are consistently much lower than the norms of Anderson and Pyle. Both sets of norms show a uniform tendency to increase from age to age. The difference in the norms is very great. The median performance of our fifteen and sixteen year olds is only equal to the average performance of the eleven or twelve year olds of the other workers. This difference in the norms must

[9] Whipple, G. M., "Vocabulary and Word Building Tests," *Psychological Review,* Vol. XV (1908), 94-105.

[10] Pyle, W. H., *op. cit.*

[11] Anderson, E. J. Reported by Whipple, G. M., "Manual of Mental and Physical Tests," Vol. II, 274 *et seq.*

A E I R L P

Figure 3. The Word Building Test.

be due either to the fact that the children tested by Anderson and by Pyle were much superior to the children tested by us or to the fact that the method of scoring differed greatly in the two investigations. The children tested by us, as will appear later, were in the main children from three fairly good and one average city school, together with a number of children from village schools, that is, by no means inferior children. We have no information in regard to the children tested by Anderson and by Pyle. In regard to the method of scoring, credit was given in this investigation for 59 words (see Part II), whereas the number of words admitted by Anderson and Pyle according to Whipple's list is 76. Nineteen words admitted by Anderson and Pyle are not admitted by us. These are as follows:— ai, al, ar, aril, ea, ela, epi, eria, la, lepra, lerp, lira, pali, parel, pi, ra, re, rei, rep. Two words admitted by us and not found in Whipple's list are —peri, pirl. The nineteen words not admitted by us are all extremely uncommon words and in our experience words that occurred very rarely in the test papers. It is doubtful whether this slight difference in the words allowed credit would explain the striking difference in the norms.

Test V Opposites Test

This test is placed by Whipple in the group of association tests. It is, moreover, a test of controlled in contradistinction to free association. There are numerous forms of controlled association tests, and the Opposites Test is one type of such tests. There are nine lists of opposites given by Whipple. The list used in these experiments is shown in Figure 4. The actual measurements of the blank are about $3\frac{1}{2} \times 7\frac{1}{2}$ inches, exclusive of margin. This list is one of the oldest and has been used by Thorndike, Simpson, Norsworthy and Pyle.

Our results may be best compared with those of Pyle as the words used and the procedure in giving the test were in both cases the same:—

Age	8	9	10	11	12	13	14	15	16	17	18	Ad.	No. of Cases
Boys, Av.....	9	8	8	11	12	15	15	16	17	20	22	22	
Pyle.....													1,262
Girls, Av.....	8	8	11	11	14	15	17	17	19	21	23	23	
Pintner, Med.....	4	7	8	10	12	14	15	15	15	..	..	20	3,452

The same general tendency for our norms to be lower is shown in this test, although the difference is not nearly so great as it was in the last test. The discrepancy is very great at age eight.

Test VI Cancellation Test

This test is classified by Whipple under tests of attention and perception. A great deal of work

OPPOSITES TEST

1. good _____
2. outside _____
3. quick _____
4. tall _____
5. big _____
6. loud _____
7. white _____
8. light _____
9. happy _____
10. false _____
11. like _____
12. rich _____
13. sick _____
14. glad _____
15. thin _____
16. empty _____
17. war _____
18. many _____
19. above _____
20. friend _____

Name _____

Age _____ Grade _____ Sex _____

FIGURE 4. THE OPPOSITES TEST.

has been done with many different forms of cancellation test and the reader must be referred to Whipple's Manual of Mental and Physical Tests for a complete account of the history and bibliography of this test, together with a description of the various forms of cancellation blank in common use.

OYKFIUDBHTAGDAACDIXAMRPAGQZTACVAOWALYX
WABTHAJJANEEFXAMEACBSVASKAIBLPHANRNPKAZI
YRQAQEAXJUDFOAIMWZSAUCGVAOABMAYDYAZJDA
JACINEVBGAOFHARPVEJCTQZAPJLEQWNAHRBUASR
SNZMWAWHACAXHXQAXTDPUTYGSKGRKVLAGKAMX
FUOFAKYAFGTMBLYZJAAVAUACXDATVDACJSIUFMQ
TXWAMQEAKHAOPXZWCAIRBRZNSOQAQLMDGUSGBO
AKNAPLPAHYOAEKALNVFARJAEHNAPWIBAYAQRKA
IUPDSHAQGHTAMZAQGMTPINURQNXJEOWYACREJDZ
UOLAJCCAKSZAUAFAERFAWAFZAWXBAVHAMBATAI
KVSTVNAPLAILAOXYSJUOVYIVPAPSDANLKRQAOJLE
GAQYEMPAZANTIBXGAIMRUSAWZAZWXAMXBDXAJZI
EACNABAHGDVSVFTCLAYKUAKCWAFRWHTQYAFAOI

FIGURE 5. THE CANCELLATION TEST.

The form of cancellation blank used in this work is known as the A-test and a copy of the blank is shown in Figure 5. The measurements exclusive of margin, etc., are $4\frac{1}{8} \times 3\frac{1}{4}$ inches. No age norms with this particular form of the test are known to the writer, and therefore, no comparison with the norms obtained in this investigation can be made.

Of the six survey tests used, this test seems to the writer to be least satisfactory. Although, on the whole, some correlation of ability in this test with general intelligence is reported by most workers, it is not very high, and this is the general impression gained by the writer in his work with this test.

Educational Tests.—Work with two educational tests is reported in Chapter VI, and they may be briefly mentioned here.

Trabue Language Scale B

This is one of the language scales constructed by Trabue.[12] The tentative standards proposed by Trabue are here compared with our results:—

Grade	I	II	III	IV	V	VI	VII	VIII	IX	Uni-versity	No. o Cases
Trabue, Med.....	..	3	6	8	10	11	12	13	14	....	....
Pintner, Med.....	4	6	8	10	11	12	13	13	14	18	1,442

Our norms, it will be noted, are higher for all grades, except grades eight and nine. Trabue's medians are estimated medians not based upon the application of Scale B, as an independent scale, to any group of school children.

[12] Trabue, M. R., "Completion Test Language Scales," *Teachers' College Contributions to Education,* No. 77 (1916).

Courtis Arithmetic Tests

The amount of work done with these tests is so great that it would be futile to attempt any description or summary of it in this book. Furthermore, the use of these tests in this work is only incidental. They have been used to show how educational achievement may be interpreted in the light of the mentality of the children.

The Courtis Standard Tests, Arithmetic, Series B, were the tests used.

CHAPTER III

THE COMPUTATION OF THE RESULTS

The number of children tested by the six survey tests varies somewhat for each test. This is due to the fact that owing to various circumstances all the tests could not always be given to all the children. For this reason the total number tested on each test, and the number at each age varies from test to test. This variation in the number is not due to any attempt to exclude specific individuals (e. g., defective children), because the attempt was always made to test all the children in a grade or in a school.

After the papers had been scored as explained in Part II of this book, tables of distribution for each test for each age were made. These tables are too extended to publish here and a description of them must suffice. All the tables showed each unit of the score. All the tests, except two, the Digit-Symbol and the Symbol-Digit, are scored without the use of fractions, and therefore the tables of distribution showed each step in the method of scoring. The table of distribution for the Rote Memory

Test showed each step from 0 to 66 (the highest score); the table for the Opposites from 0 to 20 (the highest score); and so on. In the case of the Digit-Symbol and Symbol-Digit tests fractions were disregarded in the tables of distribution, i. e., the fractions were simply omitted and the whole number (not necessarily the nearest) taken.

Furthermore, the tables of distribution were progressive, in the sense that they showed the addition of each new set of tests. At the same time the percentiles for each addition to the distribution were calculated. In this way the distribution tables show the effect of each additional set of results on the percentile norms. This method was adopted so that some idea might be obtained as to when a satisfactory standardization had been reached. The less the percentiles are changed by additions to the data, the more likely is it that we have attained a satisfactory standardization. The additions to the data were not equal, so that we cannot claim that the series of percentiles calculated for each age represented equal additions or equal percentages of the first set of cases. The additions to the data from time to time were very unequal and were determined by the number of new cases that happened to be tested from time to time.

At most ages there were five or six additions to the original data, so that we have five or six sets of

percentiles. An inspection of the variation of these percentiles gives some idea of the adequacy of the standardization. If the variation is slight and shows a tendency to decrease, we may assume that the standardization is becoming more and more adequate. Because of the great amount of space required to print all these percentiles, we have decided merely to show three at each age, regardless of the fact that progression from one set of percentiles to the other may represent very varying additions at different ages. Three series of percentiles taken at three different stages in the standardization will give some idea of the adequacy of the standardization.

Tables 1 to 6 show the three series of percentiles at each percentile point for each age for the six tests. The first figure shows the percentile calculated for the first set of tests, the second the percentiles at about the middle of the standardization and the third the percentiles for the data tabulated up to the present time. Table 1 is to be read as follows:—on the Rote Memory Test for age seven (third vertical column) the 100 percentile or highest score for the first set of data was 39, after the addition of the second set it was still 39, and after the addition of the third set 39. In other words no change occurred in the 100 percentile. The first set of data as can be seen from the bottom row, headed

TABLE 1

Rote Memory Test—Percentiles

Age	6	7	8	9	10	11	12	13	14	15	16	Ad.
Percentile												
	29	39	45	50	54	61	59	59	56	58	59	
100	34	39	47	56	60	61	59	64	62	66	59	
	34	39	49	56	60	61	66	64	62	66	59	64
	14	29	33	40	44	46	48	52	53	53	54	
90	18	29	36	41	45	48	50	52	55	52	54	
	18	29	36	41	45	48	50	52	54	53	52	62
	11	25	31	37	41	44	45	48	47	49	52	
80	12	25	32	38	42	45	47	49	52	49	52	
	12	25	32	38	42	45	47	49	51	49	50	58
	6	21	28	35	39	41	44	46	44	45	52	
70	7	22	29	35	40	42	45	47	49	47	48	
	6	23	29	35	40	42	45	47	49	47	47	57
	4	19	26	32	37	39	41	43	43	44	49	
60	4	19	27	34	38	40	42	45	46	45	47	
	4	20	27	33	37	40	43	45	45	45	47	56
	3	16	23	30	34	37	40	40	42	42	47	
50	4	17	25	32	35	38	41	43	44	43	45	
	3	18	25	31	34	38	41	43	44	43	45	56
	3	13	21	27	32	36	38	39	39	38	47	
40	3	13	22	29	32	36	39	40	42	41	44	
	2	14	22	28	32	36	39	40	42	41	42	55
	2	9	17	25	29	33	36	36	38	36	45	
30	2	10	18	26	30	33	37	39	40	39	42	
	2	11	18	26	30	33	36	38	40	40	41	51
	1	6	12	22	26	31	34	34	35	33	45	
20	1	6	13	23	27	31	34	36	38	37	40	
	0	7	14	23	27	31	34	35	38	37	38	50
	0	3	6	17	19	27	30	29	32	29	42	
10	0	3	6	18	21	28	31	32	35	33	34	
	0	3	7	18	21	27	29	32	35	32	36	46
	0	0	0	3	6	17	20	24	14	25	28	
0	0	0	0	1	0	1	13	14	14	25	28	
	0	0	0	1	0	1	9	14	14	25	28	37
	121	291	291	220	195	156	118	96	65	25	13	
Totals	124	346	379	320	311	279	231	275	190	89	37	
	132	394	442	416	391	347	311	351	331	179	60	38

TABLE 2

Digit-Symbol Test—Percentiles

Age	6	7	8	9	10	11	12	13	14	15	16	Ad.
Percentile												
	13	17	17	21	25	27	32	32	36	38	32	
100	13	19	17	25	26	27	34	40	36	38	38	
	14	20	25	25	26	33	34	40	38	39	40	50
	5	11	12	16	20	22	23	24	25	29	28	
90	4	10	12	16	20	22	25	30	29	30	32	
	4	11	13	17	20	22	25	29	30	32	33	39
	2	9	10	14	18	20	21	23	23	27	26	
80	0	9	11	14	18	20	23	26	27	28	30	
	0	9	11	15	18	20	23	26	28	29	31	37
	0	8	9	13	16	19	20	21	22	25	24	
70	0	7	9	13	17	19	21	24	25	27	27	
	0	8	10	14	17	19	21	24	27	27	28	34
	0	5	8	11	14	17	19	20	20	24	23	
60	0	5	8	11	15	17	20	23	23	25	26	
	0	6	9	12	16	18	20	23	25	26	26	32
	0	3	6	9	13	15	17	19	18	23	21	
50	0	3	7	10	14	16	19	21	22	24	25	
	0	4	7	11	14	16	18	21	24	25	25	30
	0	0.5	4	8	12	14	16	17	17	21	20	
40	0	0.9	5	9	13	15	17	20	20	23	24	
	0	1	6	10	13	15	17	20	22	23	24	29
	0	0	0.6	7	9	13	14	17	16	20	18	
30	0	0	2.1	8	11	13	15	18	18	21	21	
	0	0	3.0	8	11	13	15	18	20	21	22	28
	0	0	0	5	7	10	12	15	15	19	16	
20	0	0	0	6	9	11	13	16	16	19	18	
	0	0	0.1	6	9	11	13	16	18	20	20	27
	0	0	0	0.4	3	4	7	5	3	16	15	
10	0	0	0	0.7	3	8	9	13	14	15	16	
	0	0	0	0.8	4	8	10	13	15	16	16	25
	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	0	0	0	20
	124	275	296	219	197	153	115	95	65	89	38	
Totals	166	336	384	315	312	235	229	275	193	173	82	
	175	387	449	409	391	347	308	356	367	231	114	75

TABLE 3

Symbol-Digit Test—Percentiles

Age	6	7	8	9	10	11	12	13	14	15	16	Ad.
Percentile												
	13	19	20	24	29	32	30	37	40	39	41	
100	13	19	20	24	29	34	36	40	44	39	41	
	13	19	20	26	29	34	38	40	45	39	41	53
	3	9	12	17	21	23	24	28	25	30	31	
90	3	9	13	17	21	24	26	30	32	31	33	
	3	9	13	18	21	24	27	30	32	32	33	40
	0	7	10	15	18	20	21	24	21	27	28	
80	0	7	10	15	19	21	23	27	29	28	29	
	0	7	11	16	19	21	23	27	29	29	29	38
	0	6	8	12	16	19	19	22	19	26	28	
70	0	6	9	13	17	19	21	24	27	27	28	
	0	6	9	14	17	19	21	24	27	27	28	35
	0	4	7	11	14	17	18	21	18	24	23	
60	0	4	7	12	15	17	19	23	25	25	26	
	0	5	8	12	15	18	19	23	25	25	26	33
	0	3	6	9	13	16	16	18	16	22	22	
50	0	3	6	10	13	16	18	22	22	24	22	
	0	3	6	11	14	16	18	21	23	24	23	31
	0	0.4	4	8	11	15	15	17	15	22	20	
40	0	0.9	4	8	12	15	16	20	21	22	22	
	0	1.0	5	9	12	15	16	20	21	22	22	29
	0	0	1	6	10	13	13	16	13	20	18	
30	0	0	2	7	10	13	14	19	20	21	19	
	0	0	3	8	11	13	15	18	21	21	21	28
	0	0	0	4	7	11	10	14	12	18	14	
20	0	0	0	4	7	11	12	17	18	18	15	
	0	0	0	5	8	11	12	17	18	19	16	26
	0	0	0	0.9	4	7	7	11	10	15	5	
10	0	0	0	1	4	8	8	14	15	16	11	
	0	0	0	1	5	8	9	14	14	16	12	23
	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	0	0	0	14
	123	275	297	217	196	150	123	94	64	90	39	
Totals	165	310	388	316	312	273	239	272	298	175	84	
	174	390	454	408	391	341	319	354	363	238	113	77

TABLE 4

Word Building Test—Percentiles

Age	6	7	8	9	10	11	12	13	14	15	16	Ad.
Percentile												
	6	11	11	15	17	20	18	21	17	14	21	
100	6	13	11	15	17	20	19	30	29	26	24	
	6	13	11	15	20	20	27	30	29	26	25	35
	2	4	6	8	11	13	14	13	12	10	14	
90	2	4	6	8	10	13	14	16	16	16	17	
	2	5	7	9	10	13	14	16	16	17	18	25
	1	3	4	6	9	10	11	11	10	9	13	
80	1	3	5	6	9	10	12	14	14	14	14	
	1	3	5	7	9	11	12	13	14	15	14	23
	1	2	4	5	8	9	9	10	9	8	12	
70	1	2	4	5	8	9	10	12	12	12	13	
	1	3	4	6	7	9	10	12	12	13	13	21
	1	1	3	4	6	8	8	8	8	7	11	
60	1	2	3	5	6	8	9	11	11	11	12	
	0	2	3	5	6	8	9	11	11	12	12	19
	0	1	2	4	6	6	7	7	7	6	9	
50	0	1	3	4	6	6	8	10	9	11	10	
	0	1	3	4	5	6	8	9	10	11	11	18
	0	0	2	3	4	5	6	6	6	6	5	
40	0	1	2	3	4	6	7	8	8	9	9	
	0	1	2	3	4	6	7	8	9	10	9	18
	0	0	1	2	4	5	4	4	5	4	4	
30	0	0	1	2	4	5	6	7	7	8	9	
	0	0	1	3	4	5	6	7	7	8	9	17
	0	0	1	2	2	3	4	3	4	3	3	
20	0	0	1	2	3	4	4	5	6	6	6	
	0	0	1	2	3	3	4	5	6	7	7	16
	0	0	0	1	1	2	2	2	2	2	1	
10	0	0	0	1	1	2	2	3	4	4	3	
	0	0	0	1	1	2	2	3	4	4	4	14
	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	0	0	0	11
	98	287	295	219	199	152	118	96	64	21	14	
Totals	101	344	387	316	311	277	229	275	195	149	56	
	109	391	451	410	393	344	311	354	356	215	89	39

TABLE 5

Opposites Test—Percentiles

Age	6	7	8	9	10	11	12	13	14	15	16	Ad.
Percentile												
	5	19	17	20	20	20	20	20	19	20	20	
100	5	19	17	20	20	20	20	20	20	20	20	20
	5	19	17	20	20	20	20	20	20	20	20	20
	0	7	8	10	18	15	15	16	16	16	15	
90	1	6	9	11	16	15	17	19	19	19	19	20
	1	6	9	11	15	15	17	19	19	19	20	20
	0	5	7	9	13	13	14	15	15	14	14	
80	0	5	7	9	13	13	16	17	18	18	17	20
	0	5	7	9	12	13	16	17	18	18	19	20
	0	3	6	8	11	11	13	14	13	13	13	
70	0	3	6	8	11	12	15	16	17	16	16	20
	0	4	6	8	11	12	14	16	17	16	17	20
	0	2	5	7	9	10	11	13	13	12	12	
60	0	2	5	7	9	10	13	15	16	16	15	20
	0	2	5	8	9	11	13	15	16	16	16	20
	0	2	4	6	8	9	10	12	12	11	10	
50	0	1	4	6	8	9	12	15	15	15	14	20
	0	2	4	7	8	10	12	14	15	15	15	20
	0	1	2	5	7	8	9	11	11	10	10	
40	0	1	2	5	7	8	10	13	14	14	13	19
	0	1	3	6	7	9	10	13	14	14	14	20
	0	0	1	3	6	7	9	9	10	8	9	
30	0	0	1	4	6	7	9	12	13	13	12	19
	0	0	2	5	7	8	9	12	13	13	13	19
	0	0	0	1	5	6	8	7	9	7	7	
20	0	0	0	2	5	6	9	10	12	11	11	19
	0	0	1	3	5	6	8	10	12	12	11	19
	0	0	0	0	2	4	6	6	5	6	7	
10	0	0	0	0	2	4	7	8	10	9	9	18
	0	0	0	1	2	4	7	7	10	9	10	18
	0	0	0	0	0	0	0	0	2	4	6	
0	0	0	0	0	0	0	0	0	1	0	6	13
	0	0	0	0	0	0	0	0	0	0	2	13
	94	277	296	219	196	156	120	94	67	25	13	
Totals	96	338	386	310	306	262	225	272	306	156	54	43
	104	388	453	399	384	332	305	340	356	223	86	82

TABLE 6

Cancellation Test—Percentiles

Age	6	7	8	9	10	11	12	13	14	15	16	Ad.
Percentile												
	73	48	76	97	69	65	84	98	81	78	73	
100	73	57	76	97	86	86	92	98	100	99	97	89
	73	78	76	97	86	86	92	98	100	99	97	89
	27	33	38	42	49	47	59	60	64	65	69	
90	27	33	38	43	51	53	64	72	73	76	77	82
	27	37	39	43	49	56	64	70	73	76	77	78
	23	29	34	37	42	45	51	55	55	57	64	
80	23	29	34	37	46	47	59	63	65	68	71	69
	23	31	35	38	45	48	59	62	65	68	71	69
	20	27	32	34	37	42	47	50	50	52	60	
70	20	27	32	34	39	44	53	58	61	63	67	65
	20	28	32	35	40	44	53	57	61	63	67	66
	18	25	29	32	35	39	42	48	49	49	57	
60	18	25	29	31	37	41	49	55	57	61	61	62
	18	26	29	32	37	41	49	54	57	61	61	64
	16	23	27	30	34	37	38	46	46	46	54	
50	16	23	27	30	35	38	46	51	53	56	59	60
	16	25	28	31	35	39	45	50	53	56	59	61
	14	21	25	28	32	36	37	42	42	44	50	
40	14	21	26	28	33	36	42	49	51	53	54	5
	14	22	26	29	33	36	41	48	50	53	56	56 9
	12	19	23	26	30	32	34	38	38	42	47	
30	13	18	24	26	31	34	38	46	48	49	50	54
	13	19	24	27	31	34	38	45	48	49	51	53
	9	16	20	23	28	31	32	36	35	38	45	
20	10	16	21	23	28	32	35	42	45	46	48	50
	10	17	21	24	29	32	35	40	44	46	49	50
	0	11	17	20	26	27	28	34	30	29	39	
10	0	11	18	20	24	29	31	36	38	41	42	46
	0	12	18	21	26	29	30	35	37	41	46	46
	0	0	0	0	8	13	7	26	14	27	38	
0	0	0	0	0	0	0	0	0	13	27	0	39
	0	0	0	0	0	0	0	0	13	27	0	28
	127	280	303	191	175	133	98	82	43	21	11	
Totals	169	338	392	281	279	247	208	256	280	167	78	46
	177	385	460	368	358	315	292	333	342	228	109	85

"totals," included 291 cases, the second set added 55 cases, making a total of 346, and the third set added 48 cases, making a total of 394. At age eight the 100 percentile starts with a score of 45 and changes to 47 and then to 49. The 90 percentile for the eight-year-olds starts with a score of 33, then changes to 36, at which it remains. The 70 percentile starts with 28 and then changes to 29 at which point it remains stationary. These three series of percentiles for the eight-year-olds are calculated from 291, 379 and 442 cases. The other tables are to be interpreted in the same way.

At most ages each new percentile represents roughly the addition of one hundred cases. This is not so at the upper and lower ages in which fewer cases were tested. Age six shows the addition of very few cases after the original set, owing to the fact that it was then realized that the six tests were not well adapted to six-year-olds. Ages fifteen and sixteen show a falling off in the number of cases as contrasted with the other ages and the standardization for these two ages is far less reliable than for the other ages. This is borne out by an inspection of the percentiles. They are more variable for these ages than for the other ages. It will be noted that the last column shows a small group of adults tested on each of the tests. These adults are university students and the percentile scores are not meant to

be representative for adults in general. They are merely added for the purpose of comparison in regard to what a group of superior adults can accomplish on the tests. The percentiles are in general decidedly higher than the percentiles for the children. This is, however, not true in every single case, as in the Cancellation and Opposites Tests.

Without claiming that the standardization here offered is perfect, we may say that it has at least reached a stage where the results may be used for the purpose of mental surveys without making them subject to very great error.

The total number of individuals included in the data reported here is as follows:—

Rote Memory Test	3392
Digit-Symbol Test	3609
Symbol-Digit Test	3622
Word Building Test	3462
Opposites Test	3452
Cancellation Test	3452

In Part II percentile tables for actual use in working with the tests are given. These tables give the last percentile calculated from the data tabulated up to date.

The median percentile of the six tests gives the individual mental index. An interpretation of this index can only be made when we compare it with the mental indices of children tested on the six

tests. From 2920 cases tested on all the six tests, tables of distribution of these mental indices were therefore made, and the percentile values for these indices determined. This procedure is necessary, because we are combining the results of six tests. A median percentile of 90 does not necessarily mean that the child is a ninety per cent child on all the tests combined. It will probably be higher, because a median of 90 indicates that the child is more than a ninety per cent child on three tests. A mental index of 100 would mean that a child made 100 on four of the six tests and this would be very exceptional, as a matter of fact a performance that did not occur in any of the 2920 children under consideration. The table of median percentiles will be found in Part II where it can be used by the worker applying the tests.

CHAPTER IV

SURVEYS OF SCHOOLS

EXAMPLES of the use of these tests in the survey of schools and other groups of children will be given here. The tests were given, scored and the results evaluated as described in Part II of this book—Guide for the Use of the Tests.

We shall present the results from four city schools, one village school, and a group of four one-room rural schools. Table 7 shows the mental in-

TABLE 7

MENTAL INDICES BY GRADES

School	Ci.	Ch.	Cl.	Cn.	V.	R.
Grade						
II	23	42	35.5	65	7.5	12
III	45	58.5	38	64.5	34.5	9.5
IV	57	58	42	58.5	30	18
V	65	50	44	42	18	30
VI	65	44	58.5	68	40	17
VII	58.5	35	58	....	42	8
VIII	58.5	42	68.5	....	42	36
IX	65	65	....	....	....	....
Whole School	58.5	47	44.5	58.5	30	17

dex of each grade for the six schools. The mental indices on this table are the corrected medians as derived from Table 28 (page 110). That is to say, the median percentile for the grade was interpreted in the light of the distribution of median percentiles as given in that table. This gives us a more correct rating of the mentality of the group. The four city schools are called Ci, Ch, Cl, Cn. The C in this case denotes "city." The village school is designated V, and the group of rural schools R. The table is to be read as follows:—the median mental index of the second grade in school Ci is 23, in school Ch 42, in school Cl 35.5, and so on. The next line gives the median mental indices for grade three. The last line shows the median mental index for the whole school, and this may be taken as a measure of the mentality of the school.

Figure 6 shows the same facts as Table 7. The fluctuation of the curves would seem to indicate considerable variability in the mentality of the children in different schools and in different grades of the same school. One characteristic, common to all of the schools, except the village school, is the relatively higher mentality of the last grade in the school. This is seen in the rise of the curves for the highest grade, making the mentality of the children in the highest grade generally higher than that of any other grade in the same school. This characteristic

does not apply to any one grade, but to the highest grade which the school happens to have. In schools Ci and Ch the highest grade is the ninth and the

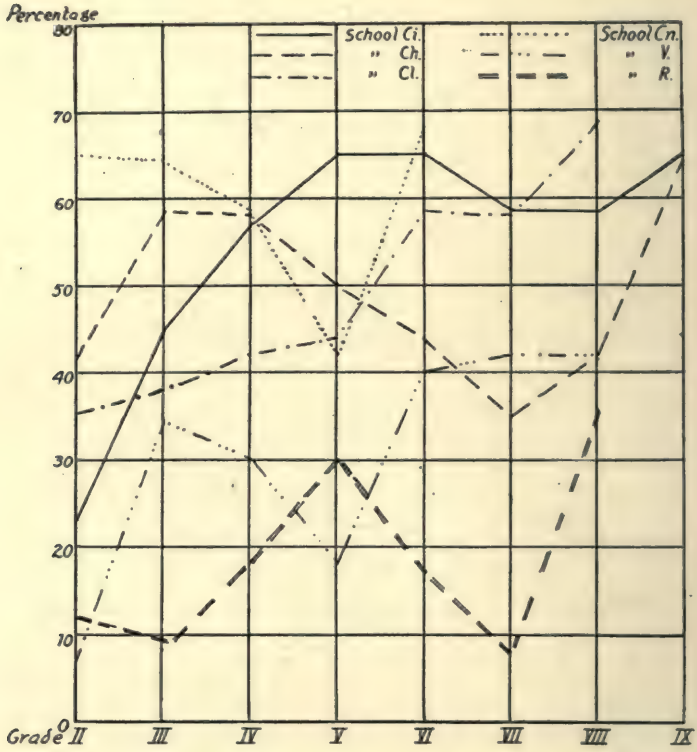

FIGURE 6. MENTAL INDICES BY GRADES.

mental index of this grade in each case is at least as high as that of any other grade, and higher than the grades immediately preceding. In schools Cl and R the highest grade is the eighth and in both

these cases the mental index is higher than any other grade in these schools. In school Cn the highest grade is the sixth and again we find the index of this grade higher than that of any other grade in the same school. It will be noted that in most of these five schools the grades immediately preceding the highest have relatively low mental indices. It would seem probable that the school looks upon the highest grade, whichever grade this may happen to be, as a kind of select grade, a sort of graduating class from which the most retarded pupils are excluded. It may be that mental surveys of other schools may not find this to be a general custom. The number of schools tested in this investigation is not sufficient for a generalization of this kind.

The great variability of the mental index in the different grades of the same school is noticeable and may reflect in a way the different customs in regard to promotion in the different schools. Grade two in school Ci is abnormally low and this is accounted for by the fact that one section of this grade was unfortunately not tested, and this, according to the principal, was a brighter section than the section tested.

The last horizontal row on Table 7 shows the median index for the whole school. The highest index is obtained by Ci and Cn, i. e., 58.5 in each case. Ci is a junior high school in a very good quarter of

the city and is recognized as one of the best schools in the city in regard to the class of children attending the school. Cn is a school, which only goes up to the sixth grade. It is in much the same neighborhood as Ci and sends most of its pupils, who graduate from the sixth grade, to Ci. Cn, however, gets a certain small proportion of its pupils from a less desirable district than that from which the majority of its pupils come. These pupils as a rule do not go much, if at all, beyond the sixth grade and therefore this element does not enter into school Ci. We shall see the effect of this element in another comparison of the schools immediately.

School Ch ranks next to the two foregoing schools with an index of 47. This is another junior high school, the population of which is rather mixed. It may be described as composed of a very desirable class, a good middle class and a certain number of a poorer and more shiftless class.

School Cl ranks next with an index of 44.5. This school is in a good working class district, a district by no means as desirable as the districts in which the other schools are situated, but at the same time by no means one of the worst in the city. Its rank in regard to the other four schools is according to expectation. It was unfortunate that one of the schools in the worst district of the city could not be

surveyed in time to be included in the results of the present investigation.

The fifth in rank of the schools tested is the village school with an index of 30. This is a sleepy, unprogressive village and the mental index probably sums up adequately the average mentality of the population.

The rural schools rank lowest with an index of only 17. This was a great surprise to the writer, who had indeed expected an index lower than the city schools, but certainly not one so low. The fault may lie with the tests, although the results so far obtained would not seem to indicate this. It may be that this particular rural community does not possess a high grade of mentality. The results obtained in this case will be made the starting point for an investigation into the mentality of the children in urban and in rural communities. This particular rural community cannot, of course, be taken in any sense as typical of rural communities in general. We shall expect to find great variation in the mentality of rural communities, just as we find great variation in the mentality of the population in different sections of a city.

Another group of children, not a school, were also tested by the writer and will be mentioned here for purposes of comparison. The group included 94

children in a county children's home.[13] The mental index of this group was 13, an index much lower than that of any of the schools tested. Knowing the type of children in this county home, we see that our survey tests bear out our knowledge of their mentality by placing them lower than any of the schools tested.

Classification of Individuals.—Our survey tests cannot be used for individual diagnosis, because of the errors that may enter into the tests when given as group tests. We may, however, use them for a general classification into groups realizing that some particular cases may not be rightly classified. Some children may be placed too high and others too low. The general classification may nevertheless give us a fairly true picture of the group.

Using the five-fold classification into Very Bright, Bright, Average, Backward and Dull, as suggested in Part II, and using the limiting points there given, we arrive at the results shown in Tables 8 and 9. All children six years and under have been omitted, because the mental indices for the six-year-olds cannot be used for the classification here adopted (see Table 28, p. 110). Table 8 gives the actual numbers and is to be interpreted as follows:— In school Ci

[13] Pintner, R., "The Mentality of the Dependent Child, Together with a Plan for a Mental Survey of an Institution," *J. of Ed. Psych.*, Vol. VIII, 3 (1917), 220-238.

TABLE 8

CLASSIFICATION OF CASES—NUMBERS

School	Very Bright	Bright	Average	Back-ward	Dull	Total
Ci.	93	127	398	78	44	740
Ch.	49	75	277	94	40	535
Cl.	33	77	295	88	56	549
Cn.	55	72	190	51	45	413
V.	1	9	77	25	40	152
R.	0	2	26	22	33	83

TABLE 9

CLASSIFICATION OF CASES—PERCENTAGES

School	Very Bright	Bright	Average	Back-ward	Dull	Total
Ci.	12.6	17.2	53.7	10.6	5.9	100.0
Ch.	9.2	14.0	51.7	17.6	7.5	100.0
Cl.	6.0	14.0	53.9	16.0	10.1	100.0
Cn.	13.3	17.4	46.0	12.4	10.9	100.0
V.	0.7	5.9	50.6	16.4	26.3	99.9
R.	0	2.4	31.4	26.5	39.8	100.1

93 children are classified as Very Bright, 127 as Bright, 398 as Average, 78 as Backward, and 44 as Dull, making a total of 740. The rest of the table is to be read in the same way.

Table 9 shows the same facts expressed in percentages, and is to be read as follows:— In school Ci 12.6 per cent of the 740 pupils tested are classified as Very Bright, 17.2 per cent as Bright, and so forth.

These tables give us more insight into the composition of the schools. All the schools, with the exception of R, show the largest percentage of pupils in the Average group, and all of these, with the exception of Cn, show 50 per cent or more in this group. The greatest variation among the schools is in the Very Bright and Dull groups, where the greatest variation is to be expected.

This classification shows us more detail about each school. Ci is characterized by a large percentage of very bright pupils, as we would expect in a school situated as it is. Moreover, there is a high percentage of bright pupils and a very low percentage of dull pupils.

Cn shows a high percentage of very bright and bright pupils, representing the pupils from the good district from which it draws. It also shows a high percentage of dull pupils representing the poorer district from which it also draws. The pupils from this district as a rule do not go from Cn to Ci, and hence they do not affect the percentage of the dull group in Ci.

Ch shows a fair proportion of very bright pupils. Its characteristic, however, is a very large percentage of backward pupils, representing the poorer district from which it draws some of its pupils.

Cl shows a fairly normal distribution with a slight

preponderance in the dull group. It lacks its due proportion of very bright pupils.

The village school is shifted very much towards the lower end of the distribution. It possesses much more than its rightful share of dull pupils. It is woefully lacking in very bright pupils.

The poverty of the rural school is shown in its lack of very bright and bright pupils in particular, but also in its relatively small percentage of average pupils. The percentage of dull pupils is larger than the percentage of any other group in that school. The percentage of backward pupils is also very large. If our tests represent fairly the mentality of the children, and if the mentality of the children in a community is a fair index of the mentality of the community as a whole, then the mentality of this community cannot be very high.

For purposes of comparison, again, we add here the classification of the 94 children in the children's home:— Very Bright—0 per cent; Bright—7.4 per cent; Average—24.5 per cent; Backward—21.3 per cent; Dull—46.8 per cent. According to expectation, this group of children shows a larger percentage of dull children than any of the schools tested. The actual percentage of feebleminded and borderline cases in this children's home, as diagnosed by individual examinations, was 20.7 per cent. It is well to note that by "Dull" we do not mean feeble-

minded. More than the definitely feebleminded are included in the Dull group. At the present time it would not seem feasible to diagnose feebleminded-ness by means of these survey tests. It is very probable that in the Dull group most, if not all, of the feebleminded cases will be found.

By these sample surveys of schools we have attempted to show what may be done at present with the survey tests. They will give us a convenient mental index for a whole school and they will allow us to gain some insight into the composition of the school in regard to the mentality of the children attending the school.

CHAPTER V

THE SURVEY TESTS AND OTHER ESTIMATES OF INTELLIGENCE

Comparison with Estimates of Teachers.—The question of the reliability of the survey tests as a measure of intelligence may be examined in the light of their agreement or disagreement with the estimates of the pupils' abilities as given by the teachers. In three of the schools the teachers were asked to rank the children in their grades in order of intelligence, and in all cases the teachers were found willing to co-operate in the work.

It was impossible and impracticable to give any detailed explanation as to what is meant by general intelligence. Undoubtedly, very different concepts of general intelligence existed in the minds of different teachers. Some probably had a fairly good idea as to the psychologist's conception of general intelligence, whereas others would scarcely differentiate general intelligence from ability to do school work. On the whole, therefore, we should not expect nor desire a very high correlation between the ranking of the children on the survey tests and the

ranking of the children by the teacher. If the teachers' correlations were in all cases very high, this would denote one of two possibilities. The first would be that the teacher had a very accurate concept of general intelligence and was able, without the use of tests, to rank her pupils accurately. In this case, the labor involved in making the tests would be more or less superfluous. The second possibility would be that the teacher was ranking according to school knowledge and high correlations in that case would mean that the tests were testing school knowledge and not general ability. Uniformly high correlations are, therefore, undesirable. On the other hand, we may expect great variations in the correlations of different teachers, varying according to their idea of general intelligence and according to their insight into the abilities of their pupils. On the whole, however, we should expect a positive correlation of a fair size, since the teachers as a group have some idea as to what general intelligence means, as distinguished from school knowledge, and do possess some ability to rank their pupils in accordance with this idea, while abstracting from their scholastic performance.

The correlations calculated by the Spearman Foot-Rule Method, shown in Table 10, seem to bear out the points mentioned in the discussion above. The table shows the correlations for the classes in

TABLE 10

CORRELATIONS—TEACHER'S ESTIMATES AND SURVEY TESTS

Grade	Ci	School Ch	Cl
2a	.76	.69	.77
2b	.28	.44	.52
3a	.60	.62	.35
3b	.34	.75	.32
4a	.38	.14	—.19
4b	.59	.51	.73
5a	.44	.75	.37
5b1	.47	.31	.41
5b2	...	...	.14
6a	.71	.54	.62
6b	.47	.23	.44
7a	...	...	.50
7b	...	...	—.05
8a	...	...	.45
8b	...	...	.20
Av. r	.50	.50	.37
A. D.	.13	.17	.19
Av. r for all classes	...	.45	...

three schools. Ci and Ch, the two junior high schools, do not show correlations for the seventh and eighth grades, because these grades are conducted on the department plan and it was impossible to get estimates from all the teachers concerned. School Ci shows an average r for ten classes of .50, with an extreme range from .28 to .76. With the exception of 2B showing a correlation of .28, most of the other classes show a fair correlation. On the whole, the teachers in this school might be classed above the average in training and intelligence. As we have stated before it is a very desirable school in a very desirable district and naturally attracts a superior type of teacher, superior in social status, not necessarily in regard to teaching ability, with reference to which the present investigation has no concern. Closer inspection of the 2B grade with a correlation of .28 shows that the teacher ranked second a ten-year-old boy who ranked last in the survey tests. A ten-year-old in the second grade is very probably not a child of high intelligence, and the teacher was most likely influenced by the child's knowledge of school subjects. While this does not in itself explain the low correlation, it suggests the factors that are at work in some instances tending to lower the correlations.

School Ch shows the same average correlation for all the classes as does school Ci, although the aver-

age deviation is somewhat greater as also is the range from the lowest, .14, to the highest, .75. There are two correlations which are decidedly low, 4A with a correlation of .14 and 6B with a correlation of .23. In grade 4A we find an eleven-year-old ranked third by the teacher and sixteenth by the tests and also a twelve-year-old ranked ninth by the teacher and fifteenth by the tests, showing that the age of the child tends to be overlooked by the teacher in her estimate of ability.

The average of the correlations by classes for school C1 is .37, a lower average than in the other two schools. As we stated before, the school is in a much less desirable district than the other two schools, and it is probable that the teachers in this school are on the average not as well educated as the teachers in the other two schools. It was the distinct impression of the writer when discussing the results of the survey with the teachers of this school, that the general nature of the work of measuring intelligence was not nearly so well understood by them as by the teachers in the other two schools. In examining the correlations we note for the first time the appearance of two negative correlations, namely minus .19 for 4A and minus .05 for 7B. Inquiry as to the method the teachers employed in ranking their pupils resulted in the interesting discovery that 4A with a correlation of —.19 had been

ranked by a substitute teacher during a short absence of the regular teacher. Furthermore, the teacher of 7B, with a correlation of —.05, said that she ranked her class on the basis of their school standing, not seeming to make any distinction in her own mind between general intelligence and school ability. No specific reasons for the low correlations of .14 in 5B and .20 in 8B, apart from the general neglect to consider chronological age, were found.

The average correlation for all the 35 classes of all the three schools is .45. It seems to fulfill our expectations in being positive and fairly high, showing that on the whole there is some agreement between the teachers' concept of general intelligence and the abilities measured by the survey tests. Again the wide variation between different teachers bears out the contention that they have very different conceptions as to general intelligence, ranging all the way from identity with school ability to something which probably approximates the ordinary psychological concept.

Correlation of Survey Tests and Yerkes Scale.— Shortly before the survey tests were given in school Cn, the children in three of the grades had been tested by the Yerkes-Bridges Point Scale. This allows a possibility of comparing the ranking on the survey tests with the ranking on the Yerkes Scale.

The Yerkes tests were for the most part given by about six advanced students of the writer and the testing is not offered here as expert testing. Some error is bound to enter in, due to the inexperience of the examiners and the number of examiners employed.

The number of children in each class and the correlations by the Spearman Foot-Rule Method are as follows:—

Grade	r.	No. of Cases
6B.....	.29	37
4B.....	.59	34
2B.....	.71	27
All three grades..	.57	98

The correlation for the total 98 cases is a fair correlation, considering the sources of error that may enter into any individual's rank on the survey tests. The correlation for 6B is rather low and no satisfactory explanation offers itself at present. Whether there is any significance in the decrease of the correlation as we go from the younger to the older children is not obvious. It may be that either the Yerkes Scale or the survey tests or both become less reliable for the older children, i. e., for children of ages eleven to thirteen.

These correlations merely bear out the point, that we have emphasized before, that for individual diag-

noses the survey tests are much too unreliable and that wherever any importance attaches to the diagnosis of the individual, some scale of individual tests should be used. Children will be found who rank fairly low on the survey tests and high on the Yerkes. They may have been lazy or indisposed at the time the survey tests were given and have refused their best coöperation, something which the examiner in testing a class of children will be unable to detect. Again, a few rank low on the Yerkes and high on the survey tests. In such cases the child may have disobeyed instructions on the survey tests and continued working after the signal to stop had been given, or he may have copied from a neighbor, e. g., in the Word Building Test, or have written the words as the examiner read them in the Rote Memory Test, and so on. These sources of error decrease the reliability of our survey tests for purposes of individual diagnosis.

The difference between the Yerkes Scale and the survey tests is further brought out by a distribution into five groups according to each test. A fivefold classification has been made in each case and is as follows:—

	V. Br.	Br.	N. or AV.	B.	F. M. or D.
Yerkes, C.M.A.....	34	30	24	10	0
Yerkes, 3% Hypoth.	20	36	32	10	0
Survey tests.....	9	15	53	13	8

A close agreement particularly at the two ends of the distribution is not to be expected, since the group dull on the survey tests is meant to be a larger group than the group of Feebleminded, as also with the very bright group at the upper end.

The number in the very bright group according to the Yerkes Scale seems disproportionately large, suggesting, as has been noted by other workers, that the norms for the Yerkes Scale are too low or that our method of diagnosis is too lenient. Diagnosing by the Three Per Cent Hypothesis [14] corrects to some extent the great number of very bright cases. That the number in the very bright group seems disproportionately large is obvious when we call to mind that the Three Per Cent Hypothesis is based on the assumption of three per cent very bright, while the survey test group of very bright is based upon the assumption of ten per cent very bright. We should expect fewer very bright cases according to the Yerkes than according to the survey tests. The same considerations affect the feebleminded or dull group, and here our expectations are borne out by finding a greater number in this group for the survey tests than for the Yerkes Scale.

This variation in the distribution of the cases ac-

[14] Pintner, R. and Paterson, D. G., "A Psychological Basis for the Diagnosis of Feeblemindedness," *J. of Criminal Law and Criminology,* Vol. VII, 1 (1916), 32-55.

cording to the Yerkes Scale and the survey tests indicates that either the norms for the Yerkes Scale are too low or that the norms for the survey tests are too high.

Relation between the Survey Tests and the Binet Scale.—A comparison of 48 individuals tested by the Binet Scale (Goddard's Revision) and the survey tests will give further insight into the reliability of the tests.[15] The cases were taken individually so that very probably more reliable results were obtained than in the usual class test. All these 48 cases were pupils in a school for defective children. The 48 cases were distributed in chronological age as follows:—

Between ages	11	and	14....	14	cases
"	" 15	"	19....	16	"
"	" 20	"	24....	8	"
"	" 25	"	29....	5	"
"	" 33	"	39....	5	"
Total.....				48	cases

In comparing the results of the survey tests with the Binet ages of a group that differed so widely in mental age as determined by the Binet Scale, as this group did, it was deemed best to find the median mental age on the survey tests, instead of the per-

[15] The writer wishes to thank the Psychological Department of the Vineland Training School and in particular Miss Lucile Boylan, who gave the tests, for their kind coöperation in this work.

centile. In this way the findings of the two tests could be compared directly with each other, and, furthermore, our percentiles are not reliable above age fifteen and a great many of the cases were above that age.

In computing the mental age the medians or 50 percentiles were used. The child's score on each test was given the age to the median score of which it corresponded, interpolation between ages being used. The median of the six mental ages thus obtained was taken as the mental age of the child.

The distribution of the cases by mental age as computed by the Binet Scale and by the survey tests is shown in Table 11. It will be noted that the range in mental age is much greater on the survey tests than on the Binet Scale. The limit of the Binet Scale is age eleven, but some of the cases on the survey tests show a median mental age of many years above age eleven. The median mental age by the Binet is 9.3, and by the survey tests 9.05. The closeness of the medians shows the similarity of the two methods in estimating the intelligence of the group, while the range of mental age as shown by the distribution indicates some difference in the classification of the individuals within the group.

The correlation between the ranks of the cases on the two methods by the Spearman Foot-Rule Method is $r = .66$, naturally a fairly high correla-

TABLE 11

MENTAL AGE BY BINET SCALE AND BY SURVEY TESTS

Mental Age	Number of Cases	
	Binet	Survey
—5	....	1
5	....	2
6	1	3
7	6	7
8	11	11
9	15	4
10	12	5
11	3	4
12	....	4
13	....	1
14	....	3
15	....	1
16	....	....
17	....	1
17+	....	1
Total	48	48
Med. M.A.	9.3	9.05

tion because we are dealing with a fairly heterogeneous group.

There were 22 cases that tested higher on the survey tests than on the Binet; two tested exactly the same on both scales: and 24 tested higher on the Binet than on the survey tests. The average difference of the 22 testing higher on the survey tests was + 2.3 years, while the average difference of the 24 testing higher on the Binet Scale was + 1.1 year. This shows that the survey tests offer a greater range and particularly in the upward direction. If the individual has ability, he can show it by his performance on the survey tests and attain a mental age five or six years above the Binet age.

This comparison of the Binet Scale and the survey tests goes to show as the other comparisons have done, that we must not place too much reliability on the survey tests for individual purposes, but that for groups they give a fairly accurate measure of mentality.

CHAPTER VI

EDUCATIONAL ACCOMPLISHMENT AND MENTAL ABILITY

A FUTURE use of the mental survey will unquestionably be a more accurate evaluation of the educational accomplishment of our schools. This will be one of the most practical applications of the method of the mental survey which we have described in this book. At the present time, however, we can merely indicate the method. Results of any importance we have not yet had time to collect.

If it is true, as it would seem to be, that the various grades in a school to some slight extent, and the various schools in a community to some considerable extent, differ in mentality, then it would be logical to demand progress in educational achievement in proportion to the mentality possessed by the grade or school. It is obviously unfair to a 30 per cent school to expect 50 per cent work. And conversely, a 50 per cent school should be doing 50 per cent work, or else it is marking time and wasting good material. Our mental tests give us a measure of the raw material with which the teacher has to deal. Knowing the measure of the raw material the

teacher should see to it that the raw material is effectively utilized. To take an example for purposes of illustration. If the median mental index of a third grade is about 50, then the median educational index for the grade, founded on the ability of third grades in general, should also be about 50. In other words, average third graders should be doing average third grade work. If the educational index of the grade is below 50, then either the teaching in the school is poor or the children are too far advanced for their age. This latter fact can be determined by the average age of the class. If the educational index is above 50, then the teaching is exceptionally good, i. e., better than median third grade teaching, or else the children are too old for their grade and should really be doing fourth grade work. The evaluation of educational achievement in terms of the mentality of the child will raise vital questions in regard to teaching and to school administration.

All this presupposes a standardization of our school subjects in terms of percentiles of grade ability. Just as we have standardized our mental tests in terms of percentiles for each age, in the same way each important subject in the school course will have to be standardized for each grade. With our present equipment of tests for the principal school subjects, it would not be difficult to test enough

cases in order to compute percentile norms for each grade. We have worked to some extent with two standard tests, and although the norms are by no means adequate, we will give the results more for the sake of illustrating the method than for the value of the results themselves.

Trabue Language Scale B was one of the educational tests used. In one sense of the word the Trabue Language Scales cannot be called educational tests, because ability to comprehend and handle language is not entirely dependent upon school instruction. So much language is learned from the extra-school environment. Subjects such as arithmetic, spelling, grammar, history, are much more dependent upon school instruction. Nevertheless, the results we have collected with the Trabue Language Scale B will at least serve to illustrate the method.

Table 12 gives the percentile norms for each grade. This standardization is far from complete and we do not pretend that the number of children is at all representative of school children in general. The table is to be read as follows:— The best score in the first grade is 13, the score of the 90 per cent child is 8, that of the 80 per cent child is 6, and so on down the first vertical column. The number of first grade children tested was 45. To find a child's percentile ability on the test, find the

TABLE 12

TRABUE LANGUAGE SCALE B—PERCENTILES

Grade	I	II	III	IV	V	VI	VII	VIII	IX	University
Percentile										
100	13	10	15	16	19	16	19	20	19	20
90	8	8	11	12	14	14	15	16	17	19
80	6	7	10	12	13	14	14	15	16	19
70	6	6	9	11	12	13	14	15	15	19
60	6	6	8	10	12	13	13	14	15	18
50	4	6	8	10	11	12	13	13	14	18
40	4	4	7	9	11	12	12	13	14	17
30	2	4	7	8	10	12	12	13	13	17
20	2	4	6	8	9	11	11	12	13	16
10	0	2	6	6	8	10	10	11	11	15
0	0	0	0	2	5	8	6	5	8	12
No. of Cases	45	116	184	177	204	154	186	186	144	46

column for his grade, run down the column until his score is found and then move across horizontally to the first column on the left to find his percentile. This denotes his ability with reference to children of his grade in general.

Grades 2 to 6 in school Ci and grades 2 to 8 in school Cl were tested with the Trabue Scale B about the same time that they were tested with the survey tests. The score obtained by each child was turned into a percentile value by means of Table 12 in accordance with the grade of the child. For example, a child in the second grade scoring 4 was given a percentile of 30, because 4 is equal to a 30 percentile performance for second grade children. In all cases, as in this example, where the score is the same for more than one percentile, the middle point between the percentiles having the same score was taken. In this way we have a percentile expressing achievement in language for each child. The median of these percentiles for each grade gives us an index of achievement for each grade in terms of the corresponding grades for school children in general (presuming our standardization is complete).

Table 13 shows the mental index and the language index for each grade for the two schools in question. It is to be interpreted as follows:— In school Cl in grade 2B the percentile for language achievement is 30 and the mental index is 32; in grade 2A

TABLE 13

LANGUAGE ACHIEVEMENT COMPARED WITH MENTALITY

Grade	School Cl.		School Ci.	
	Language	Mentality	Language	Mentality
2b	30	32	..	..
2a	60	42	45	23
3b	35	39	58	50
3a	50	20	55	42
4b	40	42	55	55
4a	55	42	70	62
5b1	45	59	65	61
5b2	45	39	..	..
5a	65	41	65	66
6b	53	66	40	60
6a	40	51	65	66
7b	35	45	..	..
7a	55	64	..	..
8b	45	66	..	..
8a	55	72	..	..
Whole School	50	44.5	60	58.5

the language index is 60 and the mental index 42, and so on. Presuming that our standards are accurate, we should say that in school Cl grades 2A, 3A, 4A and 5A are doing excellent language work in view of the mentality of the pupils in those grades. Grades 2B, 3B, 4B, 5B, and perhaps 7A are doing about what is to be expected considering the mentality of the pupils that make up those grades. But, in grades 5B, 6B, 6A, 7B, 8B and 8A the language work is below expectation considering the mentality of the children in those grades. Similarly, in school Ci we should pick out grades 2A and 3A as doing excellent language work, and single out grade 6B as doing exceptionally poor work. Lastly, we may compare the language achievement and the mentality of the whole school. Both schools show language achievement slightly in excess of mentality, but not to any marked extent. School Ci is doing in language just about what it ought to be doing. School Cl is a little above expectation. Furthermore, by subtracting the mental index from the language index, we find that school Ci has an excess of + 1.5 and school Cl of + 5.5. School Cl is doing slightly better language work than school Ci, if we consider the mentality of the pupils with which school Cl has to deal. Ci is absolutely better than Cl, and this is all that our educational surveys up to the present time have been able to measure.

Relatively, school Cl is better than Ci. This is a more just and a more accurate measurement of the language instruction given in school Cl.

A beginning of the same kind of evaluation in arithmetic has been made. Tables 14 to 18 inclusive give the percentiles for the four operations (speed and accuracy) as measured by the Courtis Arithmetic Tests. We convert the scores of each child into percentiles according to his grade, and from the eight percentiles so obtained arrive at a median percentile expressing his arithmetical achievement. The median of these arithmetic indices gives a measure of the arithmetical ability of the class or school. Inspection of the tables reveals the great number of cases in which the scores for contiguous percentiles are the same. This is owing to the nature of the test, which does not allow a wide range of scoring. In all probability some other arithmetic test, which allows a wider range of scoring, would be preferable for such survey purposes as we are describing.

Only one of the schools for which mental indices are at hand was given the Courtis Arithmetic test. This is school Cl and we show in Table 19 the arithmetic indices for each grade and for the whole school contrasted with the mental indices. Without going into a detailed analysis, we note that on the whole the arithmetic index is below the mental index in

TABLE 14

COURTIS ARITHMETIC TESTS, SERIES B—PERCENTILES

Grade IV

	Addition		Subtraction		Multiplication	
Percentile	Attempts	Rights	Attempts	Rights	Attempts	Rights
100	12	12	15	12	13	11
90	8	6	8	7	7	5
80	7	4	7	5	6	4
70	6	3	6	4	5	3
60	5	2	5	3	5	2
50	5	2	5	2	4	2
40	4	1	4	1	4	1
30	4	1	4	1	3	1
20	3	0	3	0	3	0
10	3	0	3	0	2	0
0	0	0	1	0	0	0
No. of Cases	439	439	439	439	439	439

TABLE 15

COURTIS ARITHMETIC TESTS, SERIES B—PERCENTILES

Grade V

	Addition		Subtraction		Multiplication		Division	
Percentile	Attempts	Rights	Attempts	Rights	Attempts	Rights	Attempts	Rights
100	14	13	17	12	13	11	14	13
90	9	7	9	8	8	6	8	6
80	8	5	8	7	7	5	6	5
70	7	4	8	6	6	5	5	4
60	6	3	7	5	6	4	5	3
50	6	3	7	4	6	3	4	2
40	5	2	6	3	5	3	4	2
30	5	2	6	3	5	2	3	1
20	4	1	5	2	4	1	3	0
10	3	0	4	1	3	1	2	0
0	0	0	0	0	1	0	0	0
No. of Cases	460	460	460	460	460	460	460	460

TABLE 16

COURTIS ARITHMETIC TESTS, SERIES B—PERCENTILES

Grade VI

	Addition		Subtraction		Multiplication		Division	
Percentile	Attempts	Rights	Attempts	Rights	Attempts	Rights	Attempts	Rights
100	15	14	18	16	18	12	15	14
90	9	7	11	9	10	8	9	8
80	8	6	10	8	8	6	8	7
70	8	5	9	7	8	6	7	6
60	7	4	8	6	7	5	6	5
50	6	3	8	6	6	4	5	4
40	6	3	7	5	6	4	5	3
30	5	2	7	4	5	3	4	3
20	5	1	6	3	5	2	4	2
10	4	1	5	2	4	1	3	1
0	0	0	0	0	1	0	0	0
No. of Cases	419	419	419	419	419	419	419	419

TABLE 17

Courtis Arithmetic Tests, Series B—Percentiles

Grade VII

	Addition		Subtraction		Multiplication		Division	
Percentile	Attempts	Rights	Attempts	Rights	Attempts	Rights	Attempts	Rights
100	17	16	21	20	15	12	22	22
90	11	9	14	12	10	8	12	11
80	10	7	12	10	9	7	10	9
70	9	6	11	9	8	6	9	8
60	8	5	10	8	8	5	8	7
50	7	4	9	7	7	4	7	6
40	7	3	8	6	6	4	6	5
30	6	2	8	6	6	3	6	4
20	5	2	7	4	5	3	5	3
10	4	1	6	4	4	2	4	2
0	1	0	3	0	1	0	1	0
No. of Cases	253	253	253	253	253	253	253	253

TABLE 18

COURTIS ARITHMETIC TESTS, SERIES B—PERCENTILES

Grade VIII

	Addition		Subtraction		Multiplication		Division	
Percentile	Attempts	Rights	Attempts	Rights	Attempts	Rights	Attempts	Rights
100	16	15	20	17	14	14	16	16
90	10	8	13	11	11	8	12	11
80	9	6	12	10	10	7	10	9
70	8	5	11	9	9	6	9	8
60	8	4	11	8	8	5	8	7
50	7	3	10	7	8	5	8	6
40	7	3	9	6	7	4	7	6
30	6	2	8	5	7	4	6	5
20	6	2	8	4	6	3	6	4
10	5	1	6	3	5	2	5	3
0	0	0	1	0	2	0	1	0
No. of Cases	263	263	263	263	263	263	263	263

TABLE 19

ARITHMETIC ABILITY COMPARED WITH MENTALITY

School Cl.		
Grade	Arithmetic	Mentality
4b	32.5	42
4a	35.0	42
5b1	32.5	59
5b2	45.0	39
5a	35.0	41
6b	33.75	66
6a	33.75	51
7b	47.5	45
7a	55.0	64
8b	53.75	66
8a	52.5	72
Whole School	40	44.5

most grades. We note, also, that the arithmetic index for the whole school, 40, is slightly below the mental index of the whole school, 44.5. Our judgment would, therefore, be that the school as a whole is not achieving quite as much as it ought to achieve in arithmetic. The difference between the two indices is slight, and we do not yet know how much weight should be attached to a difference of this magnitude. Again, we may compare the arithmetic with the language index and note that the school shows superior achievement in language as compared with arithmetic.

We have given these results to show the method of evaluation of educational achievement in terms of mentality. The standardizations of the Courtis Arithmetic Scale and of Trabue Scale B are by no means adequate for the conclusions we have drawn. We believe, however, that in the future this kind of evaluation will be insisted upon. The evaluation of educational achievement to be just and accurate must be made with due regard to the mentality of the pupil.

PART II

A GUIDE FOR THE USE OF THE SURVEY TESTS

CHAPTER VII

GIVING THE TESTS

The six survey tests have been described in Chapter II, in which place the reader will also find pictures of the tests. In this chapter the procedure of giving the tests will be explained.

If a large school is to be tested, it is well for the investigator to have some assistants to help in giving the tests, so that the whole school may be examined during the same day, and thus avoid any discussion of the tests among the children. If assistants are employed, it is imperative to drill them beforehand on the method of procedure in giving the tests. The writer has always insisted upon the assistants rehearsing the procedure before himself and the other assistants so that nothing may be left to chance when the tests are actually being given. It is well to have an estimate of the number of children in each class to be tested, so that the requisite number of blanks of each test may be tied together in bundles for each room as they will be needed. If the school is a large one, and several assistants are to be used in giving the tests, it is best to have the

number of the room for each class, and to assign definite rooms to each assistant. All this will help to save time and, what is perhaps more important, to make the conduct of the examination proceed more smoothly, and thereby avoid unnecessary dislocation of the routine work of the school. Teachers and pupils will be in a much better frame of mind, if things go smoothly, than if things are disorderly and haphazard.

When the examiner enters the room he should make a few remarks to the pupils in order to remove any fear or misunderstanding on their part. He should say that what he is going to ask them to do is not an examination, that he is not going to examine their school work, but that he is going to give them some interesting and amusing things to do (it is well to avoid the use of the word "test"), to see how well they can remember and to see how quick they are. He may tell them that these same things have been given to many other schools and that they should all try to do their best. These preliminary remarks should be brief or lengthy according to the nature of the case. As soon as the examiner feels himself en rapport with the class, as soon as the class is at perfect ease, he may go on to the testing proper.

In timing the tests, use a stop watch, if possible. If not, use the second hand of your watch, marking

down when you begin and every time the second hand comes round to this place. You cannot read the time accurately by using the minute hand only. The time for all the tests, with the exception of the first, must be accurately kept.

See that every child is provided with a pencil.

Rote Memory Test

See that every child is provided with a blank sheet of paper. The paper may be supplied by the school or by the examiner.[16] Tell the children to write their name, age and grade on the top of the sheet. The age asked for is the age last birthday. In all this work this is the age that has been used, because this is the age best known to children and the one that they ordinarily use. Confusion is sure to arise if the age at the nearest birthday is demanded.

Then say something to this effect, "I am going to see how well you can remember things. I shall read out some words keeping my hand raised up like this while I am reading. After I have stopped reading the words, I shall put my hand down like this, and as soon as you see my hand go down, write down on your paper all the words I have read just exactly in the same order as I have read them. Now

[16] I have tried supplying uniform sheets of paper for this test, but I have abandoned it because it merely adds to the bulk of test material to be carried to the school. Paper supplied by the school is quite satisfactory.

suppose I were to read these words 'dog, flower, pencil,' then as soon as you saw my hand go down, you would write on your paper like this (using the blackboard to illustrate) 'dog, flower, pencil' (all in the same line). Suppose now you forgot the word 'flower' (erasing the word), how would you let me know that you knew there ought to be a word in between 'dog' and 'pencil'? (Someone in the class should be allowed to answer the question if possible.) Yes, put a line to show where you have left out a word. I shall try to say the words as clearly as possible, but if you should not understand a word, do not interrupt the others by asking what it is. Just try to write down what you think I said. Try to remember as many words as possible and try to write them down in the right order. As soon as you have written the words, sit back in your seats, so that I may know when you have all finished and are ready for the next set. Now does everybody understand? Does anyone want to ask any questions? Get ready now." The examiner then proceeds with the test reading the words with as clear an enunciation as possible at the rate of one per second or a trifle slower. Never repeat a group of words or a single word.

The words are:

1. street, ink, lamp.
2. spoon, horse, chair, stone.

3. ground, clock, boy, chalk, book.
4. desk, milk, hand, card, floor, cat.
5. ball, cup, glass, hat, fork, pole, cloud.
6. coat, girl, house, salt, glove, watch, box, mat.

After the children have finished the last set of words, have the children sitting in the back row come forward and collect the papers.

Digit-Symbol Test

With grades four and above, it is sufficient to explain the test by holding a test sheet up in front of the class. With grades three and below a blackboard demonstration is best. Say something to this effect, "Here are nine circles at the top of the paper. In each of these circles there are numbers from one to nine and in each circle there is a little sign that belongs to the number. Each number has its sign. Here below the circles are rows of numbers and for each number there is a blank space. There are five numbers and five blank spaces on each line. Here is a number 6. What would you put in the blank space?" (Answer—the sign that belongs to six.) And so on until the class as a whole understands the procedure. With young children it is well to draw on the board the nine circles with the digits and symbols and also a sample line or two of five numbers and five little squares and to have them come to the board and actually fill in the blanks.

Give them every possible chance to understand before the test starts. "Now when I say, 'Get ready, go,' you are to turn your papers over at the word go and fill in as many as you can for five minutes. When I say 'Stop,' you must stop at once. We want to see who can fill in the most."

Distribute the papers and start the test. Use a stop watch, if possible. If you use an ordinary watch, use the second hand. You cannot keep accurate time by using the minute hand. Furthermore, if you use the second hand, jot down the time when you start the test, say at 40 seconds, and then keep your eye on the watch and mark down every time that the second hand comes around to 40 until the five minute period is completed. *Do not trust to your memory.* If you do not keep accurate time, your test will be valueless. If a child finishes before the time limit, note the time at which he finished and mark this on his test paper. This applies to all the other time limit tests.

At the end of the time, say "Stop," and see that every child stops working promptly. Have the children turn over their papers and write their name, age and grade on the back. This prevents children from going on working after the signal for stopping has been given. Have the children collect the papers as soon as they have written their name, etc.

While the children are working on this test, time can be saved by distributing the requisite number of test blanks for the next test for each row in the class. When the time for distributing these blanks comes, the children on the front row can distribute them quickly. This procedure should be adopted for all the succeeding tests.

Symbol-Digit Test

This test is to be explained in the same manner as the previous test. Preface your explanation by saying, "This time we are going to do something very much like what we did last time, only this time you are to fill in the numbers instead of the signs. Here at the top are nine circles," continuing as with the last test only somewhat more briefly and rapidly. For the younger children illustrate on the board as before.

Have the test papers distributed and give the usual signal for starting. The time limit is five minutes. At the signal for stopping, have the children turn over their blanks and write their name, age and grade. The papers are to be collected as before.

Word Building Test

The instructions are as follows:— "This time when you turn over your papers you will see at the

top six letters, and I want to see who can make the most words with those six letters. Suppose the six letters were 'a, c, o, b, m, t.' " Write these on the board and have several children in the class give suitable words, correcting them and explaining any mistakes, if such are made. Write some of these sample words on the board. If a word with the same letter used twice is given, use this as an illustration of what is not allowed. If such a word is not given, write "boot" on the board, and ask them whether this will do. Explain why it is not correct. Finally erase the letters on the board telling the class that these are not the letters they will find on the sheets, but that other letters will be found there.

Distribute the test sheets. The time limit is five minutes. At the end of this time, stop the children and have them turn over the papers and write their names, etc., as before.

Opposites Test

The instructions are as follows:— "This time when you turn over your papers, you will find a lot of words printed down one side with a blank space for you to write something in beside each word. You are to write in the opposite of each word. Now suppose you saw these words," writing on the blackboard:

long ————————
up ————————
soft ————————
north ————————

"What is the opposite of long? If a thing isn't long, what is it?" Having received the correct answer from the class, write it on the board, and proceed with the other words. Instruct the class further, "If you cannot think of a word, don't sit thinking and doing nothing. Just go on to the next word. See how many you can write down. If you have time, you can go back and fill in the words you could not think of at first."

Have the papers distributed face down, cautioning against not turning them over until the signal, because this is a one-minute test. When all are ready, give the signal to begin and stop them after one minute. Be sure to watch the time carefully. Then turn over the papers and write their names, etc., as before.

Cancellation Test

The instructions are as follows:— "This time when you turn over your papers, you will find a lot of letters printed on your paper, all muddled up. Now all that you have to do, is to cross out all the A's." Write on the board "B K A L T A M G" or any other series of capital letters. "Would you

cross out this one?" pointing to the B. "No. Would you cross out the next? No, because it is a K and not an A. Would you cross out the next? Yes. Just put a line through it like this A. Just put a line through it because that is the quickest way to cross it out. I am only going to give you one minute, so you must work as hard as you can to see who can cross out the most."

Have the papers distributed and give the signals for starting and stopping as before. Have them turn over their papers and write their names, etc., as before.

The Language Scales and Arithmetic Tests

For full directions for giving these tests the reader must be referred to Trabue's book,[17] and to the manual of instructions issued by Courtis and supplied with the tests.

[17] Trabue, M. R., "Completion Test Language Scales," *Teachers' College Contributions to Education*, No. 77 New York (1916).

CHAPTER VIII

SCORING THE TESTS

This chapter will give as detailed instructions as possible for scoring the tests.

Rote Memory Test

A credit of two is allowed for each correct word in its correct position; a credit of one for a correct word not in the right position. There are 33 words. The maximum score is, therefore, 66. No credit is deducted for misspelled words. This is not a spelling test, but a memory test, and a child is not to be penalized, because of inability to spell the words correctly. Furthermore, since there is always a possibility of misunderstanding the pronunciation of the examiner, any word that resembles in sound the correct word is given credit. Samples of such misunderstandings for which credit has been allowed are as follows:— pink for ink, lamb for lamp, deck for desk, match for mat, cut for cup, mill for milk, cart for card and so on. These are merely samples to show more clearly the method of scoring. There are many other possibilities, but it would be useless

to list them all here. The examiner must keep constantly in mind that he is giving a memory test and that it is the sole object of the test to test the memory of the child and nothing else.

The correction of a great many papers can be facilitated, if several are correcting them, by having one individual read the correct list over and over again while the others do the scoring on the papers.

Digit-Symbol Test

The number of blanks filled in correctly per minute is the score on this test. For example, if a child fills in 61 blanks correctly his score will be 12.2, i. e., 61 divided by 5. There are in all 100 blanks to be filled in and these are arranged in twenty lines. Where there are no errors, it is easiest to count the number of lines correct and this number will be the score, because the time for the test is five minutes and there are five blanks on each line (or rather half line, as the test sheet has two columns). After a little practice the calculation of the score is very simple and may be rapidly performed. The actual correction of the test blanks is somewhat tedious. This again becomes easier with practice. Some workers find the task simplified by having beside them a correct test sheet for reference.

Symbols reversed, e. g., ⅃ for ⅂, or symbols upside down, e. g., ∨ for ∧, are called errors. Sym-

bols not formed absolutely perfect, owing to haste in writing, are not considered errors. Furthermore, if the child fills in the blanks in the reverse order, i. e., writing from right to left instead of from left to right, we have not considered this an error. If such a procedure had been considered wrong, the subject would get practically no score for such a performance.

If a child finishes before the time limit, his time will be marked on the paper, if the examiner has followed our instructions. In such a case the number of correct blanks is divided by the time actually taken by the child, instead of by five. In this way it is possible to get scores above 40, and examples of such will be found on our tables of percentiles.

Symbol-Digit Test

The method of scoring is exactly the same as in the previous test. In this test the labor of correction is much less. It is most economical to correct four or five blanks at the same time, with the help of a correct version. Read over the five digits of the first line of the correct blank and then run the eye over the first line of the four or five sheets to be corrected. The procedure can be still further accelerated, if several individuals participate in the correction of the papers. In this case the most economical procedure would seem to be for one to read

aloud from a correct version, while each of the others correct four or five test sheets simultaneously.

As in the previous test, writing from right to left was not considered an error.

Misplacement of the numbers of the first line owing to the defective printing of the first asterisk on our test sheet was not considered an error. Credit was given for any correct numbers in spite of the fact that they were misplaced one space to the right in this first line of the test.

Word Building Test

The score on this test is the number of correct words. Here, of course, attention must be paid to the spelling of words. Misspelled words, even although they fulfill the conditions of the test cannot be allowed. The total number of words for which credit has been allowed is 59. Obsolete and foreign words have not been credited. In our list some uncommon words will be found, and it was decided to allow credit for these should they appear, even although the presumption is strong that whenever they do appear in a child's list, they are in reality misspellings of other words, since these uncommon words are not known to children and, indeed, to few adults. The retention of these words makes our list of possible words more complete, and their occurrence is not so frequent, as to cause any impor-

TABLE 20

Word Building Test—Words Credited

A	E	I	R	L	P
a	ear	I	Rae	lair	pa
ail	Earl	Ira	rail	lap	pail
	or				
air	earl	ire	rale	lea	pair
ale	Eli		rap	leap	pal
alp	era		rape	Lear	pale
ape			Rea	liar	paler
April			real	lie	par
are			reap	lier	pare
Ariel			rial	lip	pea
			rile		peal
			rip		pear
			ripe		pearl
					per
					peri
					peril
					pia
					pie
					pier
					pile
					pirl
					plea
					plier

tant difference in the scoring of individual papers. Words such as "ra, la," etc., have not been included. Table 20 shows the list of words allowed arranged alphabetically under the six letters used in the test.

Opposites Test

The score for this test is the number of correct opposites. Just precisely what should be called an opposite is the only difficulty in grading this test. Our procedure has been an extremely lenient one, giving credit wherever a word could by any possible means be considered an opposite of the test word. We give in Table 21 a list of all the opposites allowed. This list may not be exhaustive, but for the use of our norms we believe the best procedure would be to adhere fairly closely to this list. It will be noted that adverbs or nouns have not been credited for adjectives, nor adjectives for nouns, etc., e. g., "slowly" is not allowed as an opposite of "quick," nor "peaceful" of "war," and so on.

Cancellation Test

The number of A's cancelled is the score. No penalty attaches to omissions or errors, i. e., crossing out the wrong letter. These latter have been considered sufficiently penalized by the amount of time wasted in crossing out the wrong letter.

TABLE 21

Opposites Test—Words Credited

Test Word	Words Credited
Good	bad, poor, rotten
Outside	inner, inside, within
Quick	slow
Tall	little, low, short, small, tiny
Big	little, small
Loud	faint, gentle, low, noiseless, quiet, silent, soft, still, subdued, weak
White	black, dirty
Light	dark, darkness, dim, heavy, night
Happy	cross, discontented, disconsolate, downhearted, dreary, gloomy, glum, lonely, melancholy, miserable, mournful, sad, sorrowful, sorry, unhappy, unfortunate, wretched
False	all right, fair, faithful, frank, friendly, genuine, good, honest, loyal, natural, original, real, right, true, truthful, valid
Like	despise, different, dislike, dissimilar, hate, odd, opposite, unlike
Rich	impoverished, poor
Sick	healthy, well
Glad	angry, gloomy, mad, melancholy, sad, sorrowful, sorry, sulky, unhappy
Thin	fat, fleshy, plump, stout, thick
Empty	filled, full
War	peace
Many	few, little, one
Above	below, beneath, down, down below, under, underneath
Friend	enemy, foe, stranger

EDUCATIONAL TESTS

Trabue Completion Test

For the method of scoring and the alternatives allowed for each blank space the reader must be referred to Trabue's book, because this material is too lengthy to include here.

Courtis Arithmetic Tests

The reader must again be referred to the manual of instructions supplied with the tests.

CHAPTER IX

EVALUATING THE RESULTS

After all the test blanks have been scored, it is well to record the results for each child on some form of record card. A copy of the record card used by us appears below:—

Psychological Clinic,
The Ohio State University

The Pintner Survey Tests

Name Grade Age

	SCORE	PERCENTILE	
Rote Memory			
Digit-Symbol			
Symbol-Digit			
Word-Building			
Opposites			
Cancellation			
Median			

It will be noted that three lines have been left vacant for the inclusion of any other additional

tests that might be given. In the vertical column headed "score," the scores for the various tests are recorded. These are copied from the test blanks, since in grading the test blanks, it is easiest to jot down the score on the blank at the time of scoring, leaving the filling in of the record cards after the scoring of all the test sheets has been completed. In the vertical column headed "percentile" the percentile value for each score is recorded. These percentile values are obtained from Tables 22 to 27 inclusive, which give the percentiles for each age for each test. In the recording of these percentiles it is not profitable to work out the actual interpolation. Inspection is sufficient.

In actual practice it is generally most convenient to record all the percentiles for one test for a whole grade at a time, or for a whole school at a time. This procedure avoids the necessity for reference from one table to another in succession. Begin with the Rote Memory Test and record all the percentiles for a grade, or a school, then proceed with the Digit-Symbol Test, and so on.

To find the appropriate percentile for a score, first note the age of the child, find the age on the percentile table and run down the column until a value near the score is found. Note that each child is compared with other children of the same age regardless of his school grade. In most cases the

TABLE 22

Rote Memory Test—Norms

Age	6	7	8	9	10	11	12	13	14	15	16	Ad.
Percentile												
100	34	39	49	56	60	61	66	64	62	66	59	64
90	18	29	36	41	45	48	50	52	54	53	52	62
80	12	25	32	38	42	45	47	49	51	49	50	58
70	6	23	29	35	40	42	45	47	49	47	47	57
60	4	20	27	33	37	40	43	45	45	45	47	56
50	3	18	25	31	34	38	41	43	44	43	45	56
40	2	14	22	28	32	36	39	40	42	41	42	55
30	2	11	18	26	30	33	36	38	40	40	41	51
20	0	7	14	23	27	31	34	35	38	37	38	50
10	0	3	7	18	21	27	29	32	35	32	36	46
0	0	0	0	1	0	1	9	14	14	25	28	37

TABLE 23

Digit-Symbol Test—Norms

Age	6	7	8	9	10	11	12	13	14	15	16	Ad.
Percentile												
100	14	20	25	25	26	33	34	40	38	39	40	50
90	4	11	13	17	20	22	25	29	30	32	33	39
80	0	9	11	15	18	20	23	26	28	29	31	37
70	0	8	10	14	17	19	21	24	27	27	28	34
60	0	6	9	12	16	18	20	23	25	26	26	32
50	0	4	7	11	14	16	18	21	24	25	25	30
40	0	1	6	10	13	15	17	20	22	23	24	29
30	0	0	3	8	11	13	15	18	20	21	22	28
20	0	0	0.1	6	9	11	13	16	18	20	20	27
10	0	0	0	0.8	4	8	10	13	15	16	16	25
0	0	0	0	0	0	0	0	0	0	0	0	20

TABLE 24

SYMBOL-DIGIT TEST—NORMS

Age	6	7	8	9	10	11	12	13	14	15	16	Ad.
Percentile												
100	13	19	20	26	29	34	38	40	45	39	41	53
90	3	9	13	18	21	24	27	30	32	32	33	40
80	0	7	11	16	19	21	23	27	29	29	29	38
70	0	6	9	14	17	19	21	24	27	27	28	35
60	0	5	8	12	15	18	19	23	25	25	26	33
50	0	3	6	11	14	16	18	21	23	24	23	31
40	0	1	5	9	12	15	16	20	21	22	22	29
30	0	0	3	8	11	13	15	18	21	21	21	28
20	0	0	0	5	8	11	12	17	18	19	16	26
10	0	0	0	1	5	8	9	14	14	16	12	23
0	0	0	0	0	0	0	0	0	0	0	0	14

TABLE 25

WORD BUILDING TEST—NORMS

Age	6	7	8	9	10	11	12	13	14	15	16	Ad.
Percentile												
100	6	13	11	15	20	20	27	30	29	26	25	35
90	2	5	7	9	10	13	14	16	16	17	18	25
80	1	3	5	7	9	11	12	13	14	15	14	23
70	1	3	4	6	7	9	10	12	12	13	13	21
60	0	2	3	5	6	8	9	11	11	12	12	19
50	0	1	3	4	5	6	8	9	10	11	11	18
40	0	1	2	3	4	6	7	8	9	10	9	18
30	0	0	1	3	4	5	6	7	7	8	9	17
20	0	0	1	2	3	3	4	5	6	7	7	16
10	0	0	0	1	1	2	2	3	4	4	4	14
0	0	0	0	0	0	0	0	0	0	0	0	11

TABLE 26

OPPOSITES TEST—NORMS

Age	6	7	8	9	10	11	12	13	14	15	16	Ad.
Percentile												
100	5	19	17	20	20	20	20	20	20	20	20	20
90	1	6	9	11	15	15	17	19	19	19	20	20
80	0	5	7	9	12	13	16	17	18	18	19	20
70	0	4	6	8	11	12	14	16	17	16	17	20
60	0	2	5	8	9	11	13	15	16	16	16	20
50	0	2	4	7	8	10	12	14	15	15	15	20
40	0	1	3	6	7	9	10	13	14	14	14	20
30	0	0	2	5	7	8	9	12	13	13	13	19
20	0	0	1	3	5	6	8	10	12	12	11	19
10	0	0	0	1	2	4	7	7	10	9	10	18
0	0	0	0	0	0	0	0	0	0	0	2	13

TABLE 27

Cancellation Test—Norms

Age	6	7	8	9	10	11	12	13	14	15	16	Ad.
Percentile												
100	73	78	76	97	86	86	92	98	100	99	97	89
90	27	37	39	43	49	56	64	70	73	76	77	78
80	23	31	35	38	45	48	59	62	65	68	71	69
70	20	28	32	35	40	44	53	57	61	63	67	66
60	18	26	29	32	37	41	49	54	57	61	61	64
50	16	25	28	31	35	39	45	50	53	56	59	61
40	14	22	26	29	33	36	41	48	50	53	56	59
30	13	19	24	27	31	34	38	45	48	49	51	53
20	10	17	21	24	29	32	35	40	44	46	49	50
10	0	12	18	21	26	29	30	35	37	41	46	46
0	0	0	0	0	0	0	0	0	13	27	0	28

actual score will not correspond to any of the tabulated percentile scores but will lie somewhere between two of them. Run the eye over to the first vertical column on the left of the table to find the appropriate percentile. Estimate the distance between these two scores in terms of ten units and then record the result. For example, a nine-year-old child scoring 34 on the Rote Memory Test has a score lying between the scores of 33 and 35 on the table, i. e., between the 60 and 70 percentiles, and will therefore be given a percentile grade of 65, and this is the grade to record on his card. Again a nine-year-old scoring 29 on the same test will be given a percentile grade of 43 or 44, since his score of 29 lies between 28, or the 40 percentile, and 31, or the 50 percentile, for nine-year-olds. When the scores for several contiguous percentiles are the same, choose for the percentile to be recorded the middle percentile of those for which the scores are the same. For example, on Table 23, Digit-Symbol Test, 0 is the score for six-year-olds for all percentiles from 0 to 80. A six-year-old scoring 0 is, therefore, given a percentile of 40, i. e., the middle percentile value between the 0 and 80 percentiles. A seven-year-old scoring 0 on the same test is given a percentile of 15, i. e., midway between the 0 and 30 percentiles.

We give below a sample record:—

Name, Viola G.	Grade 3A. Score	Age 8. Percentile
Rote Memory	32	80
Digit-Symbol	11.6	83
Symbol-Digit	11.6	83
Word Building	1	25
Opposites	6	70
Cancellation	44	92
Median		81.5

This child is eight years old and, therefore, we find the percentiles in the eight year column on each of the tables of percentiles. A score of 32 in the Rote Memory Test is equal to a percentile grade of 80; a score of 11.6 in the Digit-Symbol Test is equal to a percentile grade of 83, and so on for the other tests. The child's index of mentality is shown by the median of the six percentiles. The median or middle value lies between the third and fourth value, because there are six values. The six values arranged in order of merit are 25, 70, 80, 83, 83, 92. The median lies between the third and fourth, that is, between 80 and 83, i. e., 81.5. The calculation of the median is very simple. It is not necessary to write down the values in order of merit. It is merely necessary to count up to the third value, then find the fourth and write down the interpolation between these two. It is well after this has been done to glance at the fifth and sixth values to see that no

error has been made in counting up from the lowest percentile.

After the median percentiles or mental indices for all the children have been found, it is then possible to find the median percentile or mental index for the class, for the grade and for the entire school. The median percentile or mental index of the class is, of course, the index of the middle card after all the cards of the class have been arranged in order of merit according to the mental indices of the children. The median index for the school is similarly found by ranking all the children in the school, regardless of the grades to which they belong.

The mental indices so found may serve for rough purposes of classification. A true interpretation of these is only possible when we compare them with the distribution of the mental indices in general. In other words the percentile grade for any child on each test is an accurate rating of that child's ability on each test, but the median of these percentiles does not at once give us an accurate rating of the child. We must compare the child's total performance with the total performances of other children. To do this we have constructed Table 28 which gives a percentile distribution of the individual mental indices or median percentiles of the six tests. This is given for each age and also for the total number of

TABLE 28

PERCENTILE DISTRIBUTION OF MENTAL INDICES

Age	6	7	8	9	10	11	12	13	14	15	16	Total
Percentile												
100	97	95	96	97	96	96	99	95	97	96	99	99
90	93	86	85	85	82	82	83	82	80	80	82	83
80	87	78	76	79	72	73	75	74	75	72	70	75
75	..	..	..	..	..	..	..	..	..	..	..	71
70	79	71	70	71	66	68	67	65	67	65	66	69
60	70	65	65	65	60	60	60	58	60	60	60	61
50	60	58	57	58	53	52	55	50	53	53	54	55
40	45	51	50	52	45	46	47	45	50	49	50	49
30	42	44	45	46	40	39	40	40	40	40	47	40
25	..	..	..	..	..	..	..	..	..	..	..	38
20	37	32	38	36	30	28	30	30	30	35	40	34
10	35	17	22	23	22	19	20	22	20	23	32	21
0	35	15	7	0	0	0	0	5	0	2	5	0
No. of cases	31	235	324	362	352	315	298	338	358	219	88	2920

children. The distribution of the total 2920 cases is shown in the last column.

To be absolutely accurate, we should now convert the mental index of each child into the new percentile as given on Table 28. If a nine-year-old child has a median percentile of 65, then his real mental index is 60, because 65 is equal to a percentile of 60 for nine-year-olds. Where extreme accuracy is not desired the percentiles for the total group can be used, and their use will make the work easier. The percentiles for the total group are fairly representative for all ages with the exception of age six. In most cases the conversion of each individual child's mental index into the corrected percentile is not necessary. It is, however, desirable to convert the median of any group into the corrected percentile. For example, when the medians of the classes have been obtained, it is well to convert them into the corrected percentile as given in the last column of Table 28. If a class has a median mental index of 39, then this will become 27.5, since a median percentile of 39 is made by about 27.5 per cent of the total group. The median of a whole school should always be corrected. If a school has a median mental index of 60, then this becomes 58.5.

With the individual cases, it will be rarely profitable to undertake the correction in each case, but what we are interested in doing is to obtain some

sort of a classification according to degree of intelligence. The following scheme has been used by the writer:—the upper 10 per cent is called Very Bright, the next 15 per cent Bright, the middle 50 per cent Average, the lower 15 per cent Backward, and the lowest 10 per cent Dull. The limiting points for these five classes are taken from the distribution of the total number tested. This will not give us an accurate classification of the six-year-olds and it is well to exclude them from such a classification. As can be seen from a study of the table it is not absolutely accurate for the other ages, but sufficiently so for the purpose of a general classification of the children of a school. The limiting points are:—

Very Bright	84—100
Bright	72— 83
Average	39— 71
Backward	22— 38
Dull	0— 21

This means that all children having a mental index (uncorrected) of 84 and above are to be called Very Bright; all having indices between 72 and 83 are classified as Bright; all having indices between 39 and 71 average (high average 55 to 71, low average 54 to 39); all having indices between 22 and 38 are called Backward; and all having indices below 21 are to be considered Dull. A distribution of the

number and percentage of cases in each of these groups in a school should be made, as has been demonstrated in Chapter IV in the discussion of the schools tested by us.

To sum up the procedure recommended in ordinary cases:—

1. Compute the mental index for each child.

2. Compute the median index for each class and convert this into the corrected index.

3. Compute the median index for the school and convert this into the corrected index.

4. Make a distribution of the individual cases, omitting age six, into the five-fold classification given above.

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